visual engineering
LIGHTWARE

MX6x6DVI
MX8x8DVI
MX6x6DVI-DL
MX8x8DVI-DL

User's Manual

SAFETY INSTRUCTIONS

Class I apparatus construction.

This equipment should be operated only from power source indicated on the product.

To disconnect safely from power, remove the power cord from the rear of the equipment, or from the power source. The MAINS plug is used as the disconnect device, the disconnect device shall remain readily operable.

There are no user-serviceable parts inside of the unit. Removal of the bottom cover will expose dangerous voltages. To avoid personal injury, do not remove the bottom cover. Do not operate the unit without the cover installed.

The apparatus shall not be exposed to dripping or splashing and that no objects filled with liquids, such as vases, shall be placed on the apparatus.

The apparatus must be safely connected to multimedia systems. Follow instructions described in this manual.

Replacing the AC fuse

Unplug the AC power cord from the equipment.

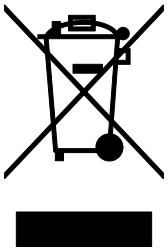
Locate the AC fuse on the rear of the unit.

Replace only the AC fuse as indicated on the rear panel of the unit: 1 A fast blowing.

Connect the power cord to the switcher and to the AC power source. Make sure the switcher is working properly.

WEEE (Waste Electrical & Electronic Equipment)

Correct Disposal of This Product



This marking shown on the product or its literature, indicates that it should not be disposed with other household wastes at the end of its working life. To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate this from other types of wastes and recycle it responsibly to promote the sustainable reuse of material resources.

Household users should contact either the retailer where they purchased this product, or their local government office, for details of where and how they can take this item for environmentally safe recycling.

Business users should contact their supplier and check the terms and conditions of the purchase contract. This product should not be mixed with other commercial wastes for disposal.

CE

DECLARATION OF CONFORMITY

We,

Lightware Kft. 1071 Budapest Peterdy str. 15 HUNGARY

as manufacturer declare, that the products

MX6x6DVI
MX8x8DVI
MX6x6DVI-DL
MX8x8DVI-DL
(Computer Matrix Switcher)

in accordance with the EMC Directive 2004/108/EC and the Low Voltage Directive 2006/95/EEC are in conformity with the following standards:

EMI/EMC ..... EN 55103-1 E3, EN 55103-2
Safety ..... EN 60065 Class I

Date: 01 March 2008

Name: Gergely Vida (Managing Director)

Signed: Vida A. Gergely

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1. Introduction

Thank you for choosing Lightware DVI matrix routers. The MX6x6DVI / MX8x8DVI routers are able to switch 6 or 8 inputs to 6 or 8 outputs respectively in a non-blocking crosspoint configuration. The MX-6x6-DVI-DL / MX-8x8-DVI-DL products can handle Dual-Link signals as well.

1.1. Box contents

- Routing switcher
- User's manual (this document)
- IEC power cable
- CD-ROM with Control Software.
- RS-232 9-pole D-Sub Male to Female cable
- UTP cross-link cable

Optional components

The router can be ordered with or without the following component parts:

- Front panel control buttons (MX-CP-8x8)
- EDID router board
- LAN interface

Some functions and chapters are only applicable if the relating optional component is installed in the matrix router. Please check your unit's configuration.

1.2. Description

Lightware MX6x6DVI and MX8x8DVI are single link, MX6x6DVI-DL and MX8x8DVI-DL are dual link DVI matrix switchers with 6 or 8 DVI inputs and 6 or 8 DVI outputs respectively, that routes any input(s) to any combination of output(s).

The router conforms to DVI 1.0 specification, and switches signals between 25 - 165 MHz pixel clock frequency: from 640x480@60Hz to 1920x1200@60Hz or 2048x1080@60Hz PC resolutions in single link, and up to 3840x2400@30Hz or 4096x2400@24Hz in dual link mode. See section *3.4* on page *16* for more information about dual link signals.

The input signal is not equalized, therefore only standard length (max. 5 meter) DVI cables can be used.

The switcher has an RS-232 (or RS-422 optional) and an RJ45 LAN port for remote control applications and a control panel for local control operation. Front panel buttons are illuminated and easily relegendable with text for informative system integration.

1.3. Features

- **Advanced EDID Management**[1] – The user can emulate any EDID on the switcher's inputs independently, read out and store any attached monitor's EDID in 100 internal memory locations, upload and download EDID files using Matrix Control Software.
- **Non-blocking cross point matrix architecture** – The router allows any input to be switched to any output or more outputs simultaneously.
- **1.65 Gb/s channel transmission** – Routes any DVI single link signal between 25 and 330 MHz pixel clock frequency conforming to DVI 1.0 standard or dual link depending on the model type.
- **Supports all HDTV resolutions** – 720p, 1080i and 1080p etc. without HDCP encoding - Unencrypted HDTV signals up to 165 MHz pixel clock frequency regardless of resolution are passed through.
- **Front panel buttons control**[2] – 8/6 source select, 8/6 destination select, Take, Load preset, Save preset, Panel Lock, Output Lock.
- **Relegendable buttons**[2] – Each button has an easy removable flat cap and a translucent label which can be inserted under it to identify sources and destinations.
- **RS-232 or RS-422 control** – Simple ASCII based RS232 protocol is used for switching, preset calling, status request, etc.
- **Ethernet control**[3] – TCP/IP Ethernet 10Base-T or 100Base TX (Auto-Sensing)
- **Built in WEB site**[3] – easy access from a WEB browser to control and configure the switcher
- **Fiber cable support** – Self powered DVI fiber cables using +5V from DVI sources (VGA cards, etc.) usually consume more than 50 mA, which load is maximum allowed by DVI 1.0 standard. It supports +5V 500 mA constant current output on each DVI output to power long distance fiber optical cables.
- **Universal power supply** – Accepting AC voltages from 100 to 240 Volts with 50 or 60 Hz line frequency on standard IEC connector.
- **Power failure memory** – In case of power failure the unit stores its latest configuration, and after next power up it loads automatically.

[1] Available only if the EDID Router board is installed.
[2] Available only if the front panel option (MX-CP-8x8) is installed.
[3] Available only if the LAN interface option is installed.

1.4. Applications

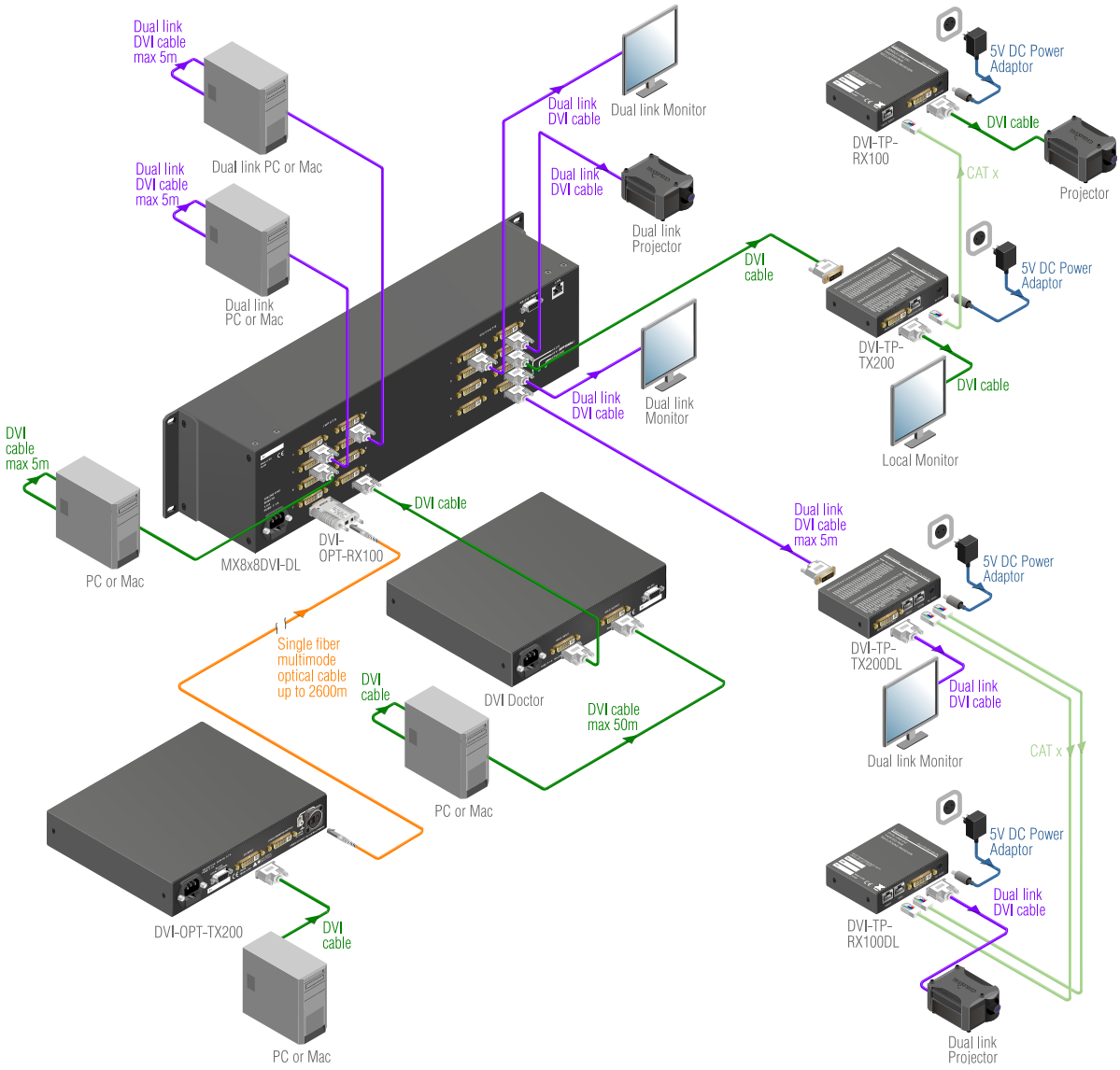
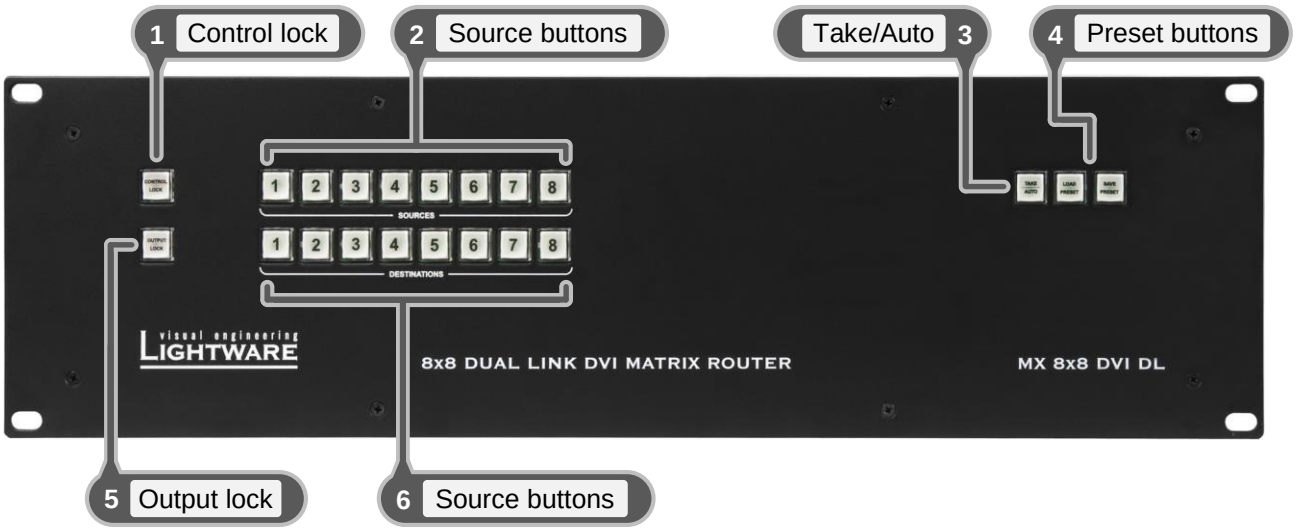


Figure 1-1. Typical application diagram

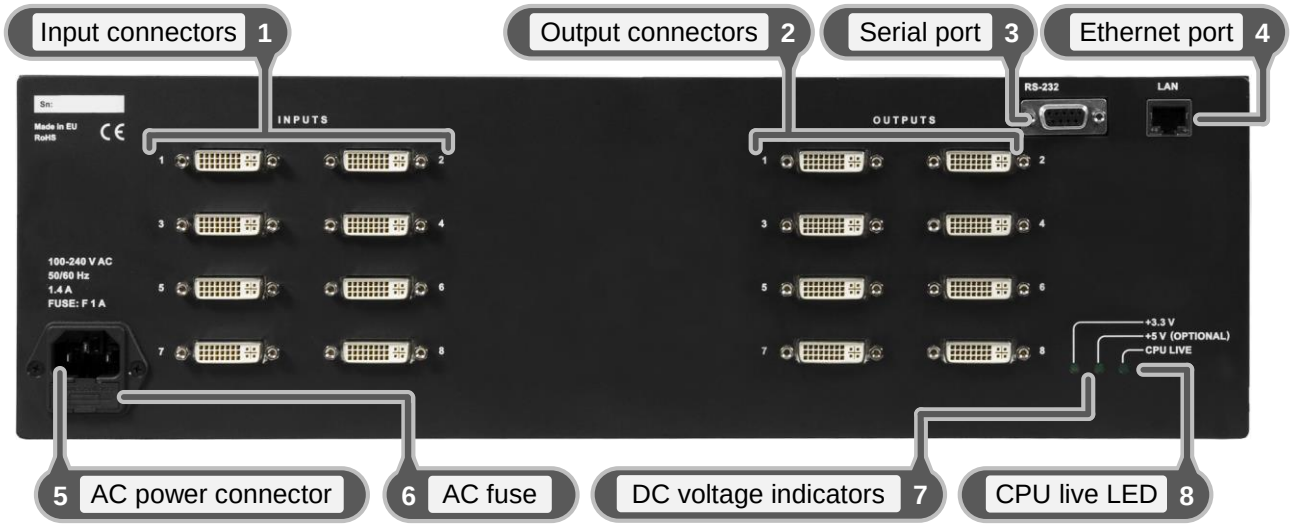
2. Controls and connections

2.1. MX8x8DVI-DL front view



1 Control lock	Disables or enables front panel operation. When red illuminated, all operations on front panel are prohibited. See section 4.2.1 on page 18 for more information.
2 Source buttons	Source buttons have three functions: to select an input, to select a preset and to view the selected input's state (only in TAKE mode). See section 4.2.3 on page 18 for more information.
3 Take / Auto	Displays the actual switching mode of the router (TAKE or AUTOTAKE). Long press toggles the switching mode, short press executes switching in TAKE mode. See section 4.2.2 on page 18 for more information.
4 Preset buttons	Load preset button loads and executes a previously save preset from one of the preset memories. Save preset button stores actual matrix state in one of the preset memories. See section 4.2.6 on page 21 for more information.
5 Output lock	Locks and protects one (or more) outputs, inhibits accidental input changing on protected output. See section 4.2.7 on page 21 for more information.
6 Destination buttons	Destination buttons have two functions: to select an output, or to view the selected output's state. See section 4.2.4 on page 19 for more information.

2.2. MX8x8DVI-DL rear view



1	**Input connectors**	29 pole DVI-I digital-only female receptacle connectors. Connect DVI source devices to these connectors.
2	**Output connectors**	29 pole DVI-I digital-only female receptacle connectors. Connect DVI sink devices to these connectors.
3	**Serial port**	9 pole D-sub female connector. Can be ordered with RS-232 or RS-422 control.
4	**Ethernet port**	RJ45 connector. Remote control port for connecting the unit to Local Area Network (LAN).
5	**AC power connector**	Standard IEC power connector. The router works with 100 to 240 Volts, 50 or 60 Hz power sources.
6	**AC fuse**	Replace with F 1 A type only.
7	**DC voltage indicators**	LED indicators for internal DC power voltages.
8	**CPU live LED**	Continuously blinking LED if the CPU works properly.

2.3. Electrical connections

2.3.1. DVI inputs

MX8x8DVI / MX8x8DVI-DL, MX6x6DVI / MX6x6DVI-DL provides 29 pole DVI-I connectors, however only digital pins are internally connected. This way, users can plug in any DVI connector, but keep in mind that no analog signals are processed. Always use high quality DVI cable for connecting sources and displays.

No input equalization is provided.

Pin	Signal	Pin	Signal	Pin	Signal
1	TMDS Data2-	**9**	TMDS Data1-	**17**	TMDS Data0-
2	TMDS Data2+	**10**	TMDS Data1+	**18**	TMDS Data0+
3	TMDS Data2/4 Shield	**11**	TMDS Data1/3 Shield	**19**	TMDS Data0/8 Shield
4	*TMDS Data4-*	**12**	*TMDS Data3-*	**20**	*TMDS Data5-*
5	*TMDS Data4+*	**13**	*TMDS Data3+*	**21**	*TMDS Data5+*
6	DDC Clock	**14**	+5V Power	**22**	TMDS Clock Shield
7	DDC Data	**15**	GND (for +5V)	**23**	TMDS Clock+
8	nc	**16**	Hot Plug Detect	**24**	TMDS Clock-
C1	nc	**C2**	nc	**C3**	nc
C4	nc	**C5**	GND		

Table 2-1. DVI-D digital only connector Single link / Dual link pin assignments

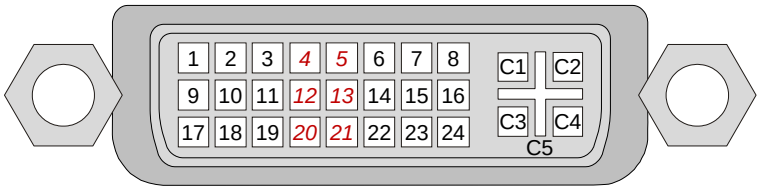


Figure 2-1. DVI-I connector

2.3.2. DVI outputs

MX8x8DVI / MX8x8DVI-DL, MX6x6DVI / MX6x6DVI-DL provides 29 pole DVI-I connectors for outputs. As standard DVI outputs there can be used limited length cables, since there is no output amplification applied. For using longer cable runs on output ports, drive currents can be set higher (for more information about output parameters see section 6.6.5 on page 36). To achieve connections between faraway devices, use fiber optical DVI cables or active DVI repeaters/extenders.

No output reclocking is provided.

Fiber Cable powering

As a special feature MX8x8DVI / MX8x8DVI-DL, MX6x6DVI / MX6x6DVI-DL is able to supply 500 mA current on DDC +5V output (pin 14 on output connectors) to power fiber optical DVI cables. Standard DVI outputs or VGA cards supply only 55 mA current on +5V output, thus unable to power directly a fiber optical cable.

Info: The matrix switcher does not check if the connected sink (monitor, projector or other equipment) supports Hotplug or EDID signals but outputs the selected signal immediately after switch command.

2.3.3. RS-232 / RS-422 control port

Lightware MX8x8DVI / MX8x8DVI-DL, MX6x6DVI / MX6x6DVI-DL can be remote controlled through industry standard 9 pole D-SUB female connector located on the rear panel of the unit. The router can be ordered with RS-232 or RS-422 control port.

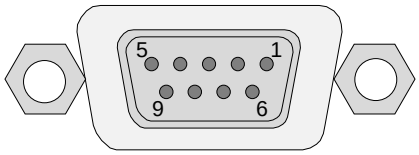


Figure 2-2. D-SUB 9 pin female (DE9F) connector

Pin nr.	RS-232	RS-422
1	NC, not connected	TX- data transmit complement
2	**TX data transmit**	TX- data transmit true
3	**RX data receive**	RX+ data receive true
4	DTR internally connected to Pin 6	RX- data receive complement
5	**GND signal ground (shield)**	GND signal ground (shield)
6	DSR internally connected to Pin 4	NC, not connected
7	RTS internally connected to Pin 8	NC, not connected
8	CTS internally connected to Pin 7	NC, not connected
9	NC, not connected	NC, not connected

Table 2-2. RS-232 and RS-422 pin connections

2.3.4. Ethernet port

The Ethernet port can be connected to a LAN hub, switch or router with a UTP patch cable. If connecting to a computer directly, a cross UTP cable has to be used!

See more information about remote operation in section 4.3 on page 23.

	LED1	LED2
OFF	no activity	no link
Amber	half duplex	10 Mbps
Green	full duplex	100 Mbps
Blink	activity	N/A

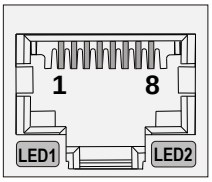


Table 2-3. RJ45 connector

Pin nr.	Name	Wire color
1	TX +	Green stripe
2	TX -	Green
3	RX +	Orange stripe
4	Not used	Blue
5	Not used	Blue stripe
6	RX -	Orange
7	Not used	Brown stripe
8	Not used	Brown

Table 2-4. Ethernet pin connections

3. Technologies

3.1. Basics

EDID stands for Extended Display Identification Data. Simply put, EDID is the passport of display devices (monitors, TV sets, projectors). It contains information about the display's capabilities, such as supported resolutions, refresh rates (these are called Detailed Timings), the type and manufacturer of the display device, etc.

After connecting a DVI source to a DVI display, the source reads out the EDID to determine the resolution and refresh rate of the image to be transmitted.

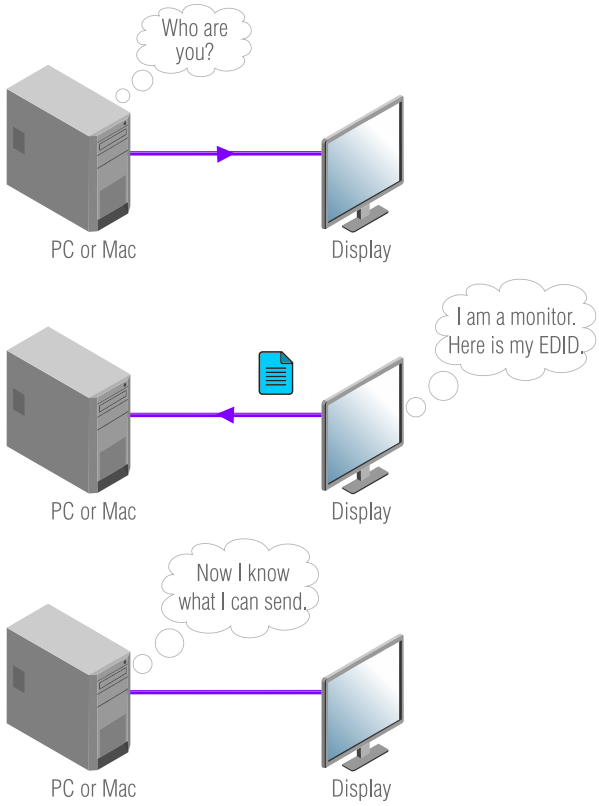


Figure 3-1. EDID communication

Most DVI computer displays have 128-byte long EDID structure. However, Digital Televisions and HDMI capable displays may have another 128 bytes, which is called E-EDID and defined by CEA (Consumer Electronics Association). This extension contains information about additional Detailed Timings, audio capabilities, speaker allocation and HDMI capabilities. It is important to know, that all HDMI capable devices must have CEA extension, but not all devices are HDMI capable which have the extension.

3.2. Common problems related to EDID

Problem: „My system consists of the following: a computer, a Lightware MX8x8DVI-DL matrix, a WUXGA (1920x1200) LCD monitor and an SXGA (1280x1024) projector. I would like to see the same image on the monitor and the projector. What EDID should I chose on the router?"

Solution: If you want to see the image on both displays, you need to select the resolution of the smaller display (in this case SXGA), otherwise the smaller display may not show the higher resolution image.

Problem: „I have changed to a different EDID on the matrix to have a different resolution but nothing happens."

Solution: Some graphics cards and video sources read out the EDID only after power-up and later they don't sense that EDID has been changed. You need to restart your source to make it read out the EDID again.

3.3. Advanced EDID management

Each DVI sink (e.g. monitors, projectors, plasma displays, and switcher inputs) must support the EDID data structure. Source BIOS and operating systems are likely to query the sink using DDC2B protocol to determine what pixel formats and interface are supported. DVI standard makes use of EDID data structure for the identification of the monitor type and capabilities. Most DVI sources (VGA cards, set top boxes, etc) will output DVI signal after accepting the connected sink's EDID information. In case of EDID readout failure or missing EDID the source will not output DVI video signal.

MX8x8DVI / MX8x8DVI-DL, MX6x6DVI / MX6x6DVI-DL provides Lightware's Advanced EDID Management function that helps system integration. The built in EDID Router stores and emulates 100 EDID data plus all monitor's EDID that are connected to the output connectors. First 50 EDID are factory presets, while memories 51 to 100 are user programmable. The router stores the EDID of all attached monitors or projectors for each output in a non-volatile memory. This way the EDID from a monitor is available when the monitor is unplugged, or switched off.

Any EDID can be emulated on any input. An emulated EDID can be copied from the EDID router's memory (static EDID emulation), or from the last attached monitors memory (dynamic EDID emulation). For example, the router can be set up to emulate a device, which is connected to one of the outputs. In this case the EDID automatically changes, if the monitor is replaced with another display device (as long as it has a valid EDID).

EDID is independently programmable for all inputs without affecting each other. All input has its own EDID circuit. EDID Router can be controlled via serial port or Ethernet.

Info: The user is not required to disconnect the DVI cable to change an EDID as opposed to other manufacturer's products. EDID can be changed even if source is connected to the input and powered ON.

Info: When EDID has been changed, the router toggles the HOTPUG signal for 200 msec. Some sources do not observe this signal, so in this case the change is not recognized by the source. In such cases the source device must be restarted, or powered OFF and ON again.

3.4. Dual link DVI signal

Single link DVI signals use three TMDS wire pairs to carry the picture, plus one TMDS wire pair for the clock signal. Dual link signals use three more TMDS wire pairs due to the higher resolution. The extra wires carry the data for every second line of the picture. Those Lightware DVI matrix routers whose model name includes a -DL tag can handle dual link signals.

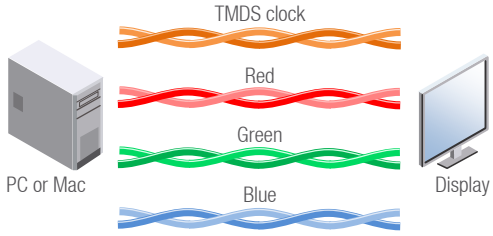


Figure 3-2. Wire pairs of the single link interface

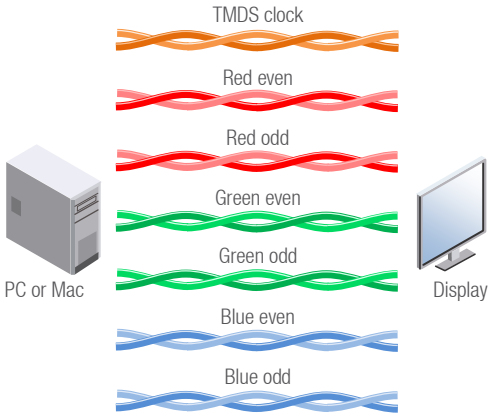


Figure 3-3. Wire pairs of the dual link interface

Info: The colors of the wire pairs in the picture represent the color information they carry and not the color of the actual wires inside the cable.

Info: Although the DVI specification describes DVI connectors with fewer pins for single link connections, some single link cables might be equipped with connectors that are fully pinned. This could confuse users if the cable is capable of transmitting dual link signals. Always check if the DVI cable is fully wired, not only equipped with the full pin connector.

Info: Some single link monitors can display dual link signals by showing every second row of the dual link image, however this way the picture will be inaccurate.

4. Operation

4.1. Powering

Connect the power cord to the router's IEC standard power input connector. The unit is immediately powered ON when the power cord is connected to the AC source. The router does not have a power switch; it remains powered on, until AC line voltage is present.

After powered on, the unit performs a self-test, then all front panel buttons light up for one second. After the self-test the router reloads its last configuration and it is ready to use.

Info: At switching ON, the router reloads the latest settings which were used before it was turning off. The unit has an internal emergency memory which stores all current settings, and ties configurations. This memory is independent from presets and invisible for the user. This built-in feature helps the system to be ready immediately in case of power failure or accidentally powering down.

4.2. Front panel operations

4.2.1. CONTROL LOCK

Front panel button operations can be enabled or disabled using CONTROL LOCK button, while RS-232 / RS-422 and Ethernet control is still enabled. If the button is not illuminated, front panel button operations are enabled. If it illuminates red continuously, front panel operations are inhibited.

Press the CONTROL LOCK button to toggle the control lock state.

4.2.2. TAKE / AUTOTAKE modes

The router has two different switching modes: TAKE and AUTOTAKE. If the TAKE / AUTO button is unlit, TAKE mode is active. When the TAKE / AUTO button continuously lights green, AUTOTAKE mode is selected.

Press and hold the TAKE button for two seconds to toggle between TAKE and AUTOTAKE modes.

TAKE mode allows the user to make multiple connections and disconnections at once. This mode is useful when time delay is not allowed between multiple switching. The commands are only realized when the TAKE button is pressed. If no button is pressed for two seconds, all preselected actions (which were not realized with the pressing TAKE) will be ignored, and the router returns to its idle state.

AUTOTAKE mode is useful when immediate actions must be done or fast switching is needed between sources on a particular destination. In this mode switching occurs immediately upon pressing one of the input selector buttons.

4.2.3. Viewing crosspoint state

User can check the current switching status on the front panel using front panel buttons. This status view feature is slightly different in TAKE or AUTOTAKE modes because of different switching philosophy of the two modes.

Info: Status view occurs whenever the router has to be switched. After entering the view state, the user can change the routing configuration. Viewing and switching can be done after each other, or if nothing is pressed for three seconds, the router returns to idle state.

View current state in TAKE mode

If all source and destination buttons and TAKE button are unlit (the unit is in TAKE mode, and no input was selected in last 3 seconds), user can verify both input and output connections. This informative display will remain for 3 seconds, and then all button lamps go out. In TAKE mode no accidental change can be done unless TAKE button is pressed.

For viewing input connections, press and release a source button. Now the selected source button and all destination buttons will light up which are currently connected to the selected source.

For viewing output connections, press and release a destination button. Now the source button which is connected to the selected destination will light up. If no source button is lighting, the selected destination is in muted state.

View current state in AUTOTAKE mode

In AUTOTAKE mode only states of destinations can be viewed.

Press and release the required destination button. Now the source button which is connected to the selected destination will light up. If no source button is lighting, the selected destination is in muted state. By pressing another destination button, the state of that destination can be seen.

Info: Be careful, as in AUTOTAKE mode if a source button is pressed, it is immediately connected to the last selected destination.

4.2.4. Switching

Creating a connection or multiple connections in TAKE mode

Step 1. First press and release the selected source button. The pressed source button and all destination buttons which are currently connected to this source will light up. The dark remaining destination buttons are not connected to this source. This is an informative display about current status of the selected input. (view only)

Step 2. Press and release the selected destination button or buttons which has to be connected to the selected source. The preselected destination button(s) start(s) blinking.

Step 3. Press and release TAKE button to execute the tie or ties. Now the selected input is switched to the selected output or to the multiple outputs.

Deselecting or muting in TAKE mode

Step 1. First press and release the selected source button. The pressed source button and all destination buttons which are currently connected to this source will light up. The dark remaining destination buttons are not connected to this source. This is an informative display about current status of the selected input. (view only)

Step 2. Press and release the selected, green lighting destination button which has to be disconnected from the selected source. The pressed destination or multiple destinations will turn dark.

Step 3. Press and release TAKE button to execute disconnection.

Important! If an input is connected to a muted output, it will be unmuted!

Info: Deselected destinations are disconnected from any source, thus output devices will display black image or "no signal" message, or automatically will turn off.

Info: Multiple switching and deselecting actions can be done simultaneously, during only one TAKE action.

Creating a connection in AUTOTAKE mode

Step 1. Press and release the desired destination button. The pressed destination button and the currently connected source‟s button light up green. If no source is connected (the output is muted) no source button will light up.

Step 2. Press and release the selected input button. The switch action will be executed immediately. Switching between sources to the selected destination can be done directly.

Deselecting or muting in AUTOTAKE mode

Step 1. Press and release the desired destination button. The pressed destination button, and the currently connected source‟s button light up green. If no source is connected (the output is muted) no source button will light up.

Step 2. Press and release the active green lighting source button. The output is muted.

Info: Deselected destinations are disconnected from any source, thus output devices will display black or blue image or "no signal" message and may automatically turn off.

4.2.5. Switching operations flowchart

To better understand the viewing and switching sequence in TAKE and AUTOTAKE modes, please study the below diagrams.

TAKE mode

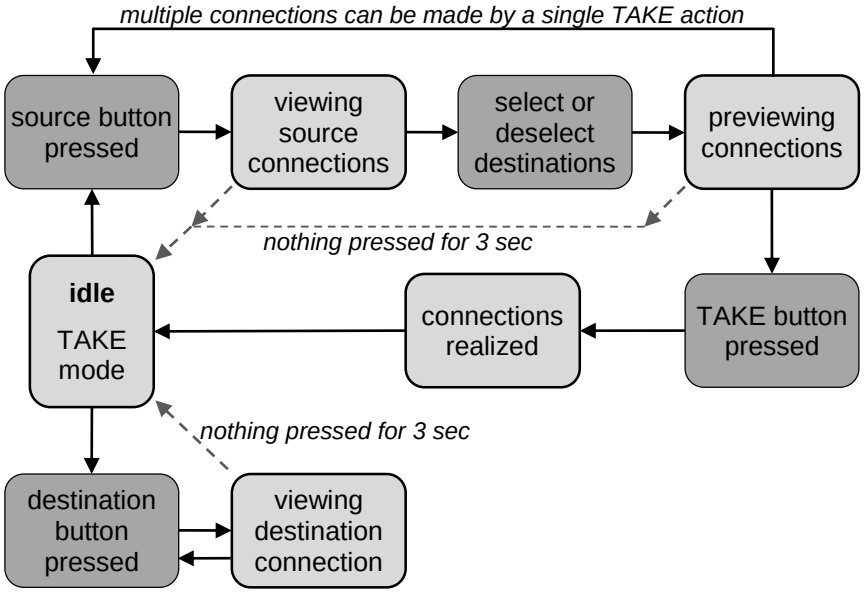


Figure 4-1. Switching flowchart in TAKE mode

AUTOTAKE mode

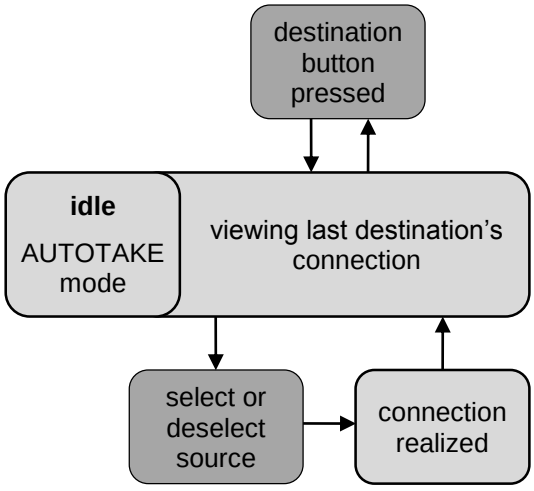
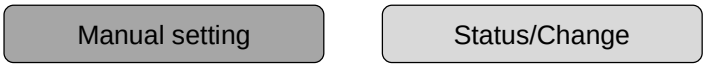


Figure 4-2. Switching flowchart in AUTOTAKE mode

Legend:



4.2.6. Preset operations

The unit has 32 user programmable presets. Each preset stores a configuration regarding all input connections and mute state for all outputs. All presets are stored in a non-volatile memory; the router keeps presets even in case of power down. Memory numbers are assigned to source buttons 1 to 8 (MX8x8DVI / MX8x8DVIDL) or 1 to 6 (MX6x6DVI / MX6x6DVI-DL). The other presets are accessible only through software control (Serial or Ethernet).

Saving a Preset in TAKE mode

Step 1. Press and release SAVE PRESET button.

Step 2. Press and release the desired source (memory address) button (source 1 to 8, or to 6)

Step 3. Press and release TAKE button. Now the current configuration is stored in selected memory.

Info: Preset save action always stores the current configuration for all outputs including mute state, but ignoring lock state.

Loading a Preset in TAKE mode

Step 1. Press and release LOAD PRESET button.

Step 2. Press and release the desired source (memory address) button (source 1 to 8 or to 6)

Step 3. Press and release TAKE button. Now the selected preset is loaded.

Info: Loading a preset modifies all output states that are not currently locked.

Saving a Preset in AUTOTAKE mode

Step 1. Press and release SAVE PRESET button.

Step 2. Press and release the desired source (memory address) button (source 1 to 8 or to 6). Now the current configuration is stored in the selected memory.

Info: Preset save action always stores the current configuration for all outputs including mute state, but ignoring lock state.

Loading a Preset in AUTOTAKE mode

Step 1. Press and release LOAD PRESET button.

Step 2. Press and release the desired source (memory address) button (source 1 to 8 or to 6). Now the selected preset is loaded.

Info: Loading a preset modifies all output states that are not currently locked.

4.2.7. OUTPUT LOCK

Using Lightware routers it is possible to lock a destination's state. This feature prevents an accidental switching to the locked destination in case of important signal. Locking a destination means, that no input selection or muting can be executed on that particular destination.

Destinations can be independently locked or unlocked. Locking a destination does not affect other destinations.

View locked outputs in TAKE mode

Step 1. Press and release the Output Lock button.

Step 2. The Output Lock button and all the buttons of any locked destinations lights up, and remain illuminated for two seconds.

Lock an output in TAKE mode

Step 1. Press and release the Output Lock button.

Step 2. Now the Output Lock button lights up in red, and all the locked output's buttons illuminates green. (view state)

Step 3. If no button is pressed for three seconds, the router returns to idle state.

Step 4. If an unlit output button is pressed, it starts to blink, to indicate that it is preselected for output locking.

Step 5. Press and release TAKE button. The selected destinations are now locked.

Unlock an output in TAKE mode

Step 1. Press and release the Output Lock button.

Step 2. Now the Output Lock button lights up in red, and all the locked output's buttons illuminates green. (view state)

Step 3. If no button is pressed for three seconds, the router returns to idle state.

Step 4. If an illuminating output button is pressed, it goes off, to indicate that it is preselected for unlocking.

Step 5. Press and release TAKE button. The deselected destinations are now unlocked.

View locked outputs in AUTOTAKE mode

In AUTOTAKE mode a destination is selected all the time. Therefore the currently selected output and input buttons are illuminated. The Output Lock button illuminates regarding to the lock state of the current output.

Viewing all locked outputs is not possible is AUTOTAKE mode, as pressing the Output Lock button instantly locks or unlocks the current output.

Lock an output in AUTOTAKE mode

Step 1. Press and release the required destination button. Now the selected destination button and the currently configured source button light up (view mode).

Step 2. Press and release the Output Lock button. Now the Output Lock button lights up in red, and lock function is activated at once. No source can be changed at the locked destination.

Unlock an output in AUTOTAKE mode

Step 1. Press and release the required destination button which was previously locked. Now the selected destination button and the currently configured source button and the Output Lock button light up

Step 2. Press and release the Output Lock button (deselect). Now the Output Lock button turns off, and the locking function has been cancelled.

4.3. Remote operation

Lightware matrix routers can be controlled through various interfaces remotely. This makes possible to use such functions that are not accessible via the front panel. Also, this helps system integrators and operators to control multiple devices in a big system through a single user interface.

Available connections

The available remote connections and the relating chapters are listed below.

User interface	Connection type		further information
	Ethernet port	RS-232 serial port	
Lightware Device Controller Software	✓	✓	chapter 5 page 25
Built-in website	✓	no	chapter 7 page 44
Third party control system	✓	✓	chapter 8 page 51

Table 4-1. Available remote connections

Info: Ethernet port can be connected to a LAN hub, switch or router with a UTP patch cable. If connecting to a computer directly, a cross UTP cable has to be used!

User interface comparison

The built-in website and the Lightware Device Controller software have little different capabilities. *Table 4-2* summarizes the main differences, helping you to select the interface that suits your needs.

Function	Lightware Device Controller	Built-in website
Platform	Windows or Mac	Any
I/O and preset names	✓	no
Preview presets	✓	no
Easy EDID creator	✓	no
EDID Editor	✓	no
EDID upload / download	✓	no

Table 4-2. User interface comparison

4.3.1. Serial port settings

MX8x8DVI / MX8x8DVI-DL, MX6x6DVI / MX6x6DVI-DL can be ordered with either RS-232 or RS-422 communication port. The port settings are done in the factory. D-SUB connector pin assignments can be found in section 2.3.3 on page 14.

The device uses standard RS-232 interface with the following settings:

- 9600 Baud
- 8 data bit
- 1 stop bit
- no parity
- null modem cable

4.3.2. Resetting the IP address

The unit's Ethernet port can be set to factory default IP configuration or to DHCP mode with front panel buttons. To set the IP configuration perform the following:

Step 1. Ensure that there is no active connection on the Ethernet port. (unplugging the LAN cable is the most secure).

Step 2. Switch the router to TAKE mode if used previously in AUTOTAKE mode by pressing TAKE button for 4 seconds. (light will go off).

Step 3. Press and release Control lock (Control lock button lights in up red continuously).

Step 4. Press and keep pressed the Output lock button (the current protocol indication will light up, this is irrelevant right now).

Step 5. Press and release the

a) **Load Preset** button to set the **factory default IP** settings

IP address:	192.168.254.254
port number:	10001
subnet mask:	255.255.0.0
gateway:	0.0.0.0.

b) **Save Preset** button to set **DHCP** enabled

IP address:	Acquired with DHCP
port number:	unchanged
subnet mask:	unchanged
gateway:	unchanged.

Step 6. A light sequence will occur to confirm the command. (Save Preset, Load Preset and Take/Auto buttons will light up one after the other).

Step 7. Reinsert the LAN cable to the Ethernet port if it was unplugged.

Step 8. Wait about 20 seconds before connecting the router via Ethernet.

5. About EDID memory

EDID router contains a 116 block non-volatile memory bank. EDID List is structured as follows:

1..50 .....Factory Preset EDID list

51..100 ..... User programmable memories

101..108 (DVI_OUT_1...8).....Last attached monitor's EDID list

109..116 (DVI_IN_1...8).....Emulated EDID at input connectors

All EDID (including factory preset; user programmable memories; EDID at other inputs; and EDID at outputs) can be switched and emulated at any of the inputs.

Info: The first 50 EDID (1…50 inclusive) are factory preprogrammed and cannot be modified. These are the most commonly used resolutions.

Info: MX8x8DVI (-DL) and MX6x6DVI (-DL) can handle both 128 Byte EDID and 256 Byte extended EDID structures.

Info: The attached monitor's EDID is stored automatically, until a new monitor is attached to that particular output. In case of powering the unit off, the last attached monitor's EDID remains in non-volatile memory.

MEMORY	Resolution		MEMORY	Resolution
01	640 x 480 @ 60.0 Hz		26	1600 x 1200 @ 50.0 Hz
02	640 x 480 @ 75.0 Hz		27	1600 x 1200 @ 60.0 Hz
03	848 x 480 @ 60.0 Hz		28	1920 x 1200 @ 59.55 Hz
04	800 x 600 @ 50.0 Hz		29	1920 x 1200 @ 50.0 Hz
05	800 x 600 @ 60.30 Hz		30	1440 x 480i @ 60.3 Hz
06	800 x 600 @ 74.99 Hz		31	640 x 480 @ 59.94 Hz
07	1024 x 768 @ 49.98 Hz		32	720 x 480 @ 59.92 Hz
08	1024 x 768 @ 60.0 Hz		33	1440 x 480i @ 60.0 Hz
09	1024 x 768 @ 75.0 Hz		34	720 x 576 @ 50.0 Hz
10	1152 x 864 @ 75.0 Hz		35	1280 x 720 @ 50.0 Hz
11	1280 x 768 @ 50.0 Hz		36	1280 x 720 @ 60.0 Hz
12	1280 x 768 @ 59.92 Hz		37	1920 x1080i @ 50.3 Hz
13	1280 x 768 @ 75.0 Hz		38	1920 x1080i @ 50.0 Hz
14	1360 x 768 @ 60.1 Hz		39	1920 x1080i @ 60.5 Hz
15	1364 x 768 @ 50.0 Hz		40	1920 x 1080 @ 24.0 Hz
16	1364 x 768 @ 59.93 Hz		41	1920 x 1080 @ 24.99 Hz
17	1364 x 768 @ 74.98 Hz		42	1920 x 1080 @ 30.0 Hz
18	1280 x 1024 @ 50.0 Hz		43	1920 x 1080 @ 50.0 Hz
19	1280 x 1024 @ 60.1 Hz		44	1920 x 1080 @ 49.99 Hz
20	1280 x 1024 @ 75.1 Hz		45	1920 x 1080 @ 60.0 Hz
21	1366 x 1024 @ 59.99 Hz		46	2048 x 1080 @ 49.99 Hz
22	1400 x 1050 @ 49.99 Hz		47	2048 x 1080 @ 50.0 Hz
23	1400 x 1050 @ 59.99 Hz		48	2048 x 1080 @ 59.99 Hz
24	1400 x 1050 @ 75.0 Hz		49	
25	1680 x 1050 @ 59.99 Hz		50	2560 x 1600 @ 59.85 Hz

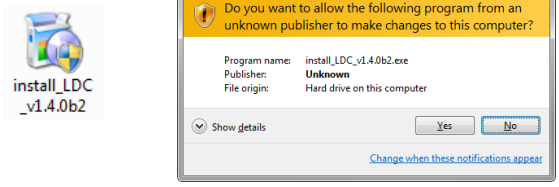
Figure 5-1. Factory Preset EDID list

6. Software control – Using Lightware Device Controller (LDC)

The matrix can be controlled by a computer through RS-232 or Ethernet port using Lightware Device Controller. The software can be installed to a Windows PC or MAC OS X. The application and the User's manual can be downloaded from www.lightware.eu. The Windows and the Mac versions have the same look and functionality.

6.1. Steps of the installation in case of Windows OS

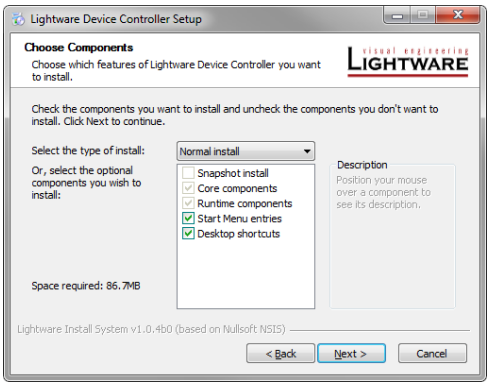
Step 1. Run *Install_LDC_v1.0.4b2.exe*
If the User Account Control drops a popup message click Yes.

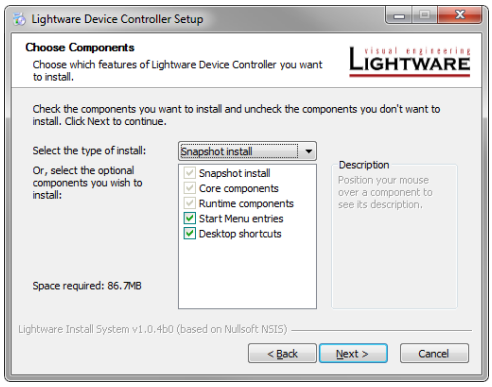

install_LDC
_v1.4.0b2
User Account Control
Do you want to allow the following program from an unknown publisher to make changes to this computer?
Program name: install_LDC_v1.4.0b2.exe
Publisher: Unknown
File origin: Hard drive on this computer
Show details
Yes
No
Change when these notifications appear

Step 2. A welcome window opens. Click Next.

Lightware Device Controller Setup
LIGHTWARE
Welcome to Lightware Device Controller Setup
Setup will guide you through the installation of Lightware Device Controller.
It is recommended that you close all other applications before starting Setup. This will make it possible to update relevant system files without having to reboot your computer.
Click Next to continue.
LIGHTWARE DEVICE CONTROLLER
Next >
Cancel

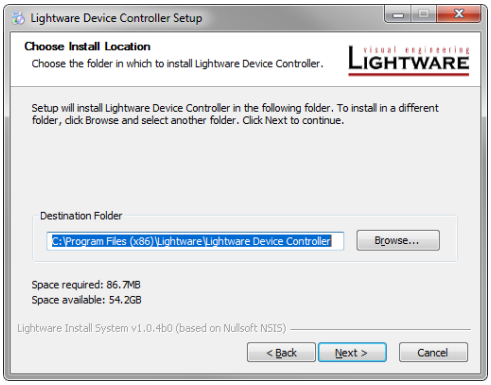
Step 3. Select the type of the installation. Here can be chosen the normal and the snapshot install. Select the optional components then click Next.
(Using the Normal install as the default value is highly recommended.)


Lightware Device Controller Setup
Choose Components
Choose which features of Lightware Device Controller you want to install.
LIGHTWARE
Check the components you want to install and uncheck the components you don't want to install. Click Next to continue.
Select the type of install:
Normal install
Or, select the optional components you wish to install:
Snapshot install
Core components
Runtime components
Start Menu entries
Desktop shortcuts
Description
Position your mouse over a component to see its description.
Space required: 86.7MB
Lightware Install System v1.0.4b0 (based on Nullsoft NSIS)
< Back
Next >
Cancel

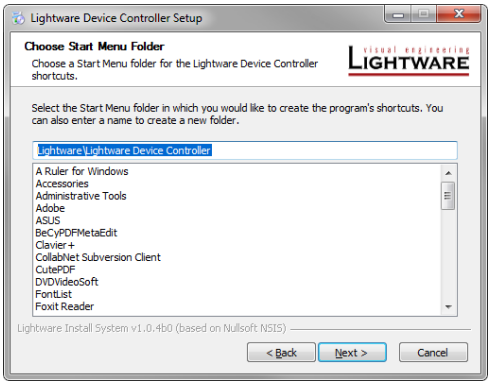

Lightware Device Controller Setup
Choose Components
Choose which features of Lightware Device Controller you want to install.
LIGHTWARE
Check the components you want to install and uncheck the components you don't want to install. Click Next to continue.
Select the type of install:
Snapshot install
Or, select the optional components you wish to install:
Snapshot install
Core components
Runtime components
Start Menu entries
Desktop shortcuts
Description
Position your mouse over a component to see its description.
Space required: 86.7MB
Lightware Install System v1.0.4b0 (based on Nullsoft NSIS)
< Back
Next >
Cancel

Normal install	Snapshot install
Available for Windows and MAC OS X	Available for Windows
The installer can update only this instance	Cannot be updated
Only one updateable instance can exist for all users	More than one different version can be installed for all users
Does not contain the version in its name	Version number is displayed in the name

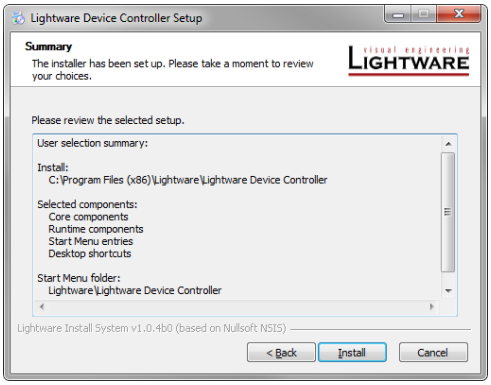
Step 4. Select the destination folder and click Next. (Using the default path is highly recommended.)


Lightware Device Controller Setup
Choose Install Location
Choose the folder in which to install Lightware Device Controller.
LIGHTWARE
Setup will install Lightware Device Controller in the following folder. To install in a different folder, click Browse and select another folder. Click Next to continue.
Destination Folder
C:\Program Files (x86)\Lightware\Lightware Device Controller
Browse...
Space required: 86.7MB
Space available: 54.2GB
Lightware Install System v1.0.4b0 (based on Nullsoft NSIS)
< Back
Next >
Cancel

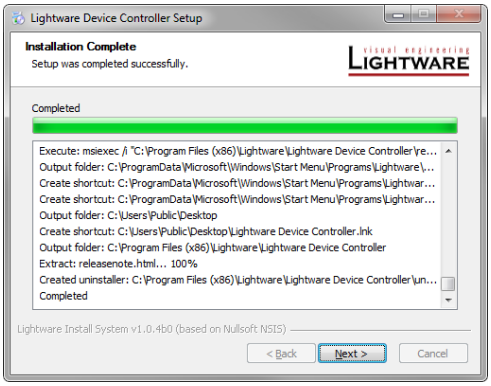
Step 5. Select the Start Menu Folder and click Next. (Using the default folder is highly recommended. If the Start menu entries was not checked in the Step 2. this window will be skipped.)



Step 6. Verify the settings and if they are correct click Install. (If not, click Back and change the setting.)



Step 7. After the installation of the last component the Next button is activated. Click on it.



Step 8. If the installation is complete, click Finish. (Uncheck the box if the running of the LDC will be delayed.)

6.2. Steps of the installation in case of Mac OS X

Info: After the installation the Windows and the Mac application has the same looks and functionality.

Step 1. Mount the DMG file with double clicking on it.

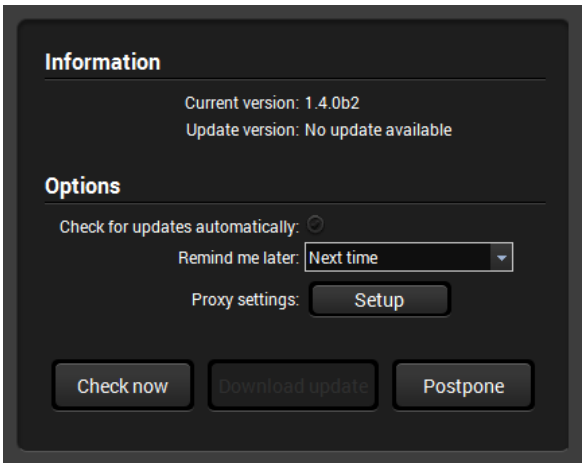
Step 2. Drag the LDC icon over the Applications icon to copy the program into the Applications folder. If you want to copy the LDC into another location just drag the icon over the desired folder.

Info: This type of the installer is equal with the Normal install in case of Windows This is an updateable version with the same attributes.

6.3. LDC Upgrade

Step 1. Run the application.

The Device Discovery window appears automatically and the program checks the available updates on Lightware's website and opens the update window if the LDC found updates.



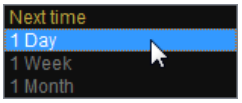
The current and the update version number can be seen in the top of the window and they are shown in this window even with the snapshot install.

The update window can be also opened by clicking the About and the Update button.

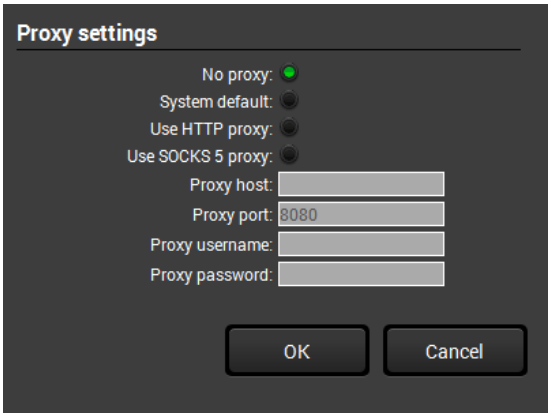
Step 2. Set the desired update setting in the option section.

a) If you do not want to check for the updates automatically, uncheck the circle, which contains the green tick.

b) If you want to postpone the update, a reminder can be set with different delays from the drop-down list.



c) If the proxy settings traverse the update process, set the proper values then click the OK button.



Step 3. Click the Download update button to start the upgrading.

User can check updates manually by clicking the Check now button.

6.4. Establishing the connection

Step 1. Connect to the device by a computer directly or via Ethernet. Cable type does not matter, both patch and cross cable can be used.

Step 2. Run the controller software; device discovery window appears automatically.

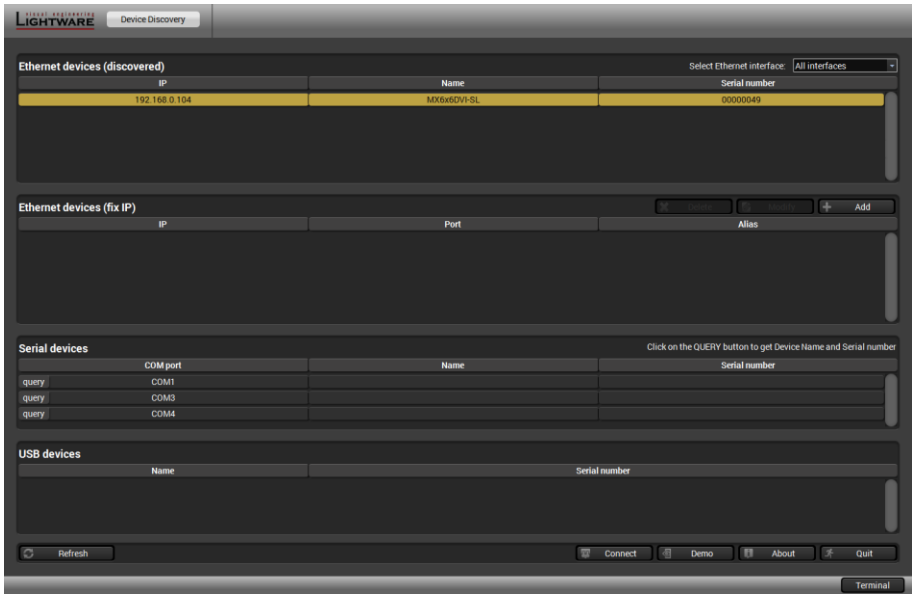


Figure 6-1. Ethernet connection in Device discovery window

Step 3. Select the desired device from the discovered devices click on the Connect button. If you do not see your device in the list, you can add it by clicking on the Add button and typing its IP address.

6.5. Crosspoint menu, Grid view

When the LDC finds the hardware, it determines the product type, and the LDC starts with the default page, showing the Grid view of the Crosspoint menu.

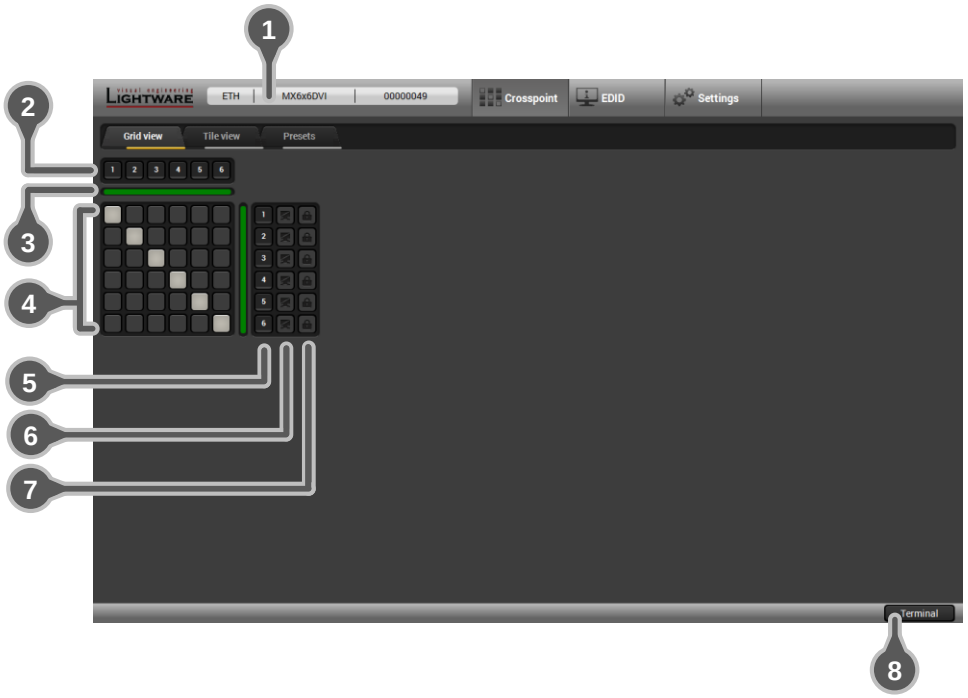


Figure 6-2. Default start page of the LDC

1	Information ribbon	This label shows the interface type, the name and the serial number of the connected device. If the device has more than one interface, the ribbon shows only that one, which has made the connection. The device discovery window can be started by clicking on this ribbon.
2	Input ports	Each number represents an input port. Click on the port to display the Properties window.
3	Type of the input board	The color of the line shows what kind of input board is installed (see next section).
4	Connections	Light grey square means the port is available but no connection between the input and the output. White square means there is a connection between the input and the output port.
5	Type of the output board	The color of the line shows what kind of input board is installed (see next section).
6	Output ports	Each number represents an output port. Click on the port to display the Properties window.
7	Mute and lock buttons	Outputs can be easily muted by clicking on the mute button; for the prevention of the unwanted switching, outputs can be locked to any input.
8	Terminal	This general-purpose terminal is created mainly for testing and debugging purposes.

Input and output board type

Lightware matrix frames can be equipped with different types of boards. The colored bars below/next to the input/output ports display the type of the board.

- Unknown board
- MX-DVID board
- MX-DVI-DL board

Info: Many Lightware devices are compact built systems, which do not have any separate boards. However, board types are shown to help identifying the ports.

6.5.1. Crosspoint operations

Switching

To make a connection, click on the desired square. If there is no connection between the desired input and output (the square is dark grey), the mouse pointer becomes a hand (link pointer) before the clicking. If the output port is not locked, then the connection is made, the square becomes white and the cursor is changed back to a pointer.

For example, input 6 is not connected to output 2 according to the first picture above. After the connection, the square becomes light grey.

Muting outputs

Outputs can be easily muted by clicking on the button figured a crossed monitor beside the output. This means that no signal is present at this output. If mute is active, the color of the button's background changes to white.

Info: Switching muted outputs does not unmute them, muting remains active until mute button is clicked again.

Info: Outputs can be disconnected from any inputs (by protocol command). In this case the crosspoint view will not show any white square for the disconnected output and the output will have no signal just like when muted. Click on a crosspoint square to connect the output again to an input.

Locking outputs

Outputs can be locked to any input. After locking an input to an output, no switching is permitted to this output unless it is unlocked again. If output lock is active, the color of the button's background changes to white.

Info: Loading a preset does not change either the lock state or the switch state of a locked output. If an output is locked to an input before preset loading it will also be locked to that input after preset loading, so locked outputs ignore the preset.

6.6. Crosspoint menu, Tile view

Tile view is a new feature of Lightware Device Controller. The new approach is to display the input and output ports by tiles. Each tile means an input or output port and additionally shows the most important port and signal information. Thus, user can check the status of many ports at the same time without clicking on a port or opening port settings window.

Three display modes are defined in Tile view: View mode, Input switch mode and Output switch mode.

6.6.1. Layout and controllers

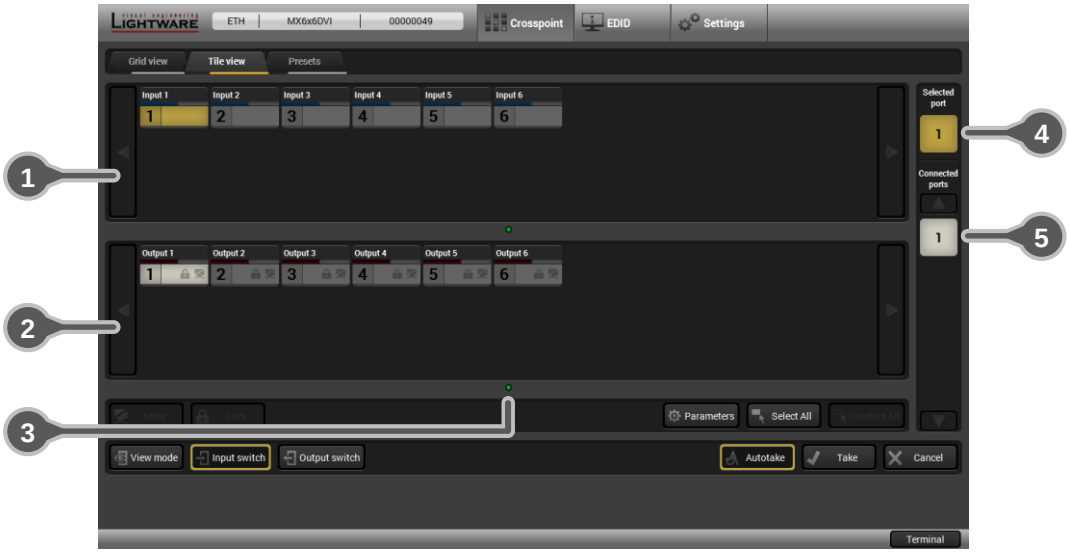


Figure 6-3. Tile view in Crosspoint menu

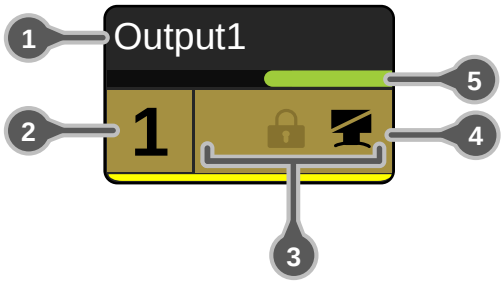
1	Input ports	Each tile represents an input port.
2	Output ports	Each tile represents an output port.
3	Page indicator	Current page is displayed with green dot; if other pages exist, they are displayed with black dots.
4	Selected port	Last selected port is displayed with yellow background on the port bar. Press the button to open port settings window.
5	Connected port(s)	Those ports are listed (with white background) on the port bar, which are connected to the Selected port.

Control buttons

Mute	Mute or unmute selected output port(s)	Parameters	Open port settings window
Lock	Lock or unlock selected output port(s)	Select All	Select all ports (only in output switch mode)
View mode	Activate View mode	Deselect All	Deselect all ports (only in output switch mode)
Input switch	Activate Input switch mode	Autotake	Toggle Autotake mode ON/OFF
Output switch	Activate Output switch mode	Take	Execute crosspoint changes in Take mode

Port tiles

The colors of the port tiles and the displayed icons represent different states and information about selected port:

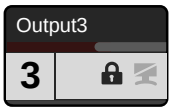


1. Port name
2. Port number
3. State indicators
4. Background color
5. Signal present (green), not present (grey)

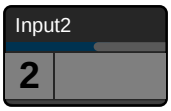
Background colors (port state)

The colors of the port tiles represent different states of the port as follows:

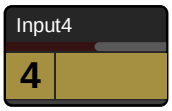
Dark grey
Port is not available
(no board is installed)



White
Connected port



Light grey
Port is available



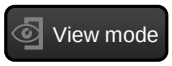
Yellow
Selected port

State indicators

Icon	Icon is not displayed	Icon is grey	Icon is black
	-	Port is unlocked	Port is locked
	-	Port is unmuted	Port is muted

6.6.2. View mode

This mode was designed to display crosspoint state of a selected- and its connected port(s).



Info: Crosspoint settings cannot be changed in View mode but port settings are available.

6.6.3. Switching operations

Crosspoint changes can be made in Input switch mode and Output switch mode. The working method is the same in both cases but the priority is different.

Input switch mode

The mode can be also named as 'Input priority-mode'. In the mode an input port has to be selected at first then connected output port(s) is/are shown. Thus, the output port(s) connected to the input port can be changed.

Output switch mode

The mode can be also named as 'Output priority-mode'. In the mode an output port has to be selected at first then connected input port is shown. Thus, the output port connected to the input port can be changed.

Info: Output ports can be (un)locked, (un)muted only in Output switch mode.

Take mode

If the Autotake button is outlined with **black** color Take mode is active. In Take mode any crosspoint change – (dis)connect ports to/from the previously selected port – is executed only after pressing the Take button. Following steps describe the process of the switching:

Step 1. Press the desired Input switch or Output switch button to select switching mode.

Step 2. Select the desired port; it will be highlighted with yellow color and also displayed on the port bar on the right.

Step 3. Connected port(s) is/are highlighted with white color and also displayed on the port bar on the right.

Step 4. Create the desired crosspoint settings by (de)selecting the ports; they will start to blink.

Step 5. Press Take button to execute changes or Cancel to ignore the operations.

Info: Take mode remains active until it is switched off. Selecting another view mode or menu does not change the Take/Autotake mode state.

Autotake mode

If the Autotake button is outlined with **yellow** color Autotake mode is active. In this mode any crosspoint change – (dis)connect ports to/from the previously selected port – is executed immediately after pressing the port button. Following steps describe the process of the switching:

Step 1. Press the desired Input switch or Output switch button to select switching mode.

Step 2. Select the desired port; it will be highlighted with yellow color and also displayed on the port bar on the right.

Step 3. Connected ports are highlighted with white color and also displayed on the port bar on the right.

Step 4. Create the desired crosspoint settings by (de)selecting the ports; the changes are executed immediately.

Info: Autotake mode remains active until it is switched off. Selecting another view mode or menu does not change the Take/Autotake mode state.

6.6.4. Port properties

Press the desired port button on the port bar on the right.

Info: Port settings of selected port are also available by pressing the Parameters button.

Figure 6-4. Port properties

6.6.5. Output port settings

Info: Some settings are only accessible with Lightware PRO series routers.

Scope of changes

The affected output can be selected in the top box, or changes can be applied to all outputs. To set the scope of the changed settings, select the desired option in the top left box.

- Apply changes to current output: The modified parameters are applied only to the currently selected port.
- Apply changes to all outputs: The modified parameters are applied to all output ports.

Info: After closing this window, the Current Output option will be selected regardless of which was active at the time of closing. It is to avoid setting All Outputs by mistake.

Reload factory defaults

- Current output: Reloads the default values to the currently selected output.
- All outputs: Loads the factory default values to all outputs.

Drive current

It specifies the drive current of the internal crosspoint circuit for each output. It is recommended to leave this value at the default 20 mA setting, this produces differentially 1 V peak to peak voltage conforming DVI specification. Alter only if experiencing signal transmission errors. Higher output drive currents can help to avoid problems when using longer cables. Modifications are done promptly when selecting a value from the drop down list.

To obtain a standard 1000 mV p-p differential output (single-ended = 500 mV p-p), the output current should be programmed to 20 mA. With an effective termination resistance of 25 Ω, this will generate the proper differential voltage.

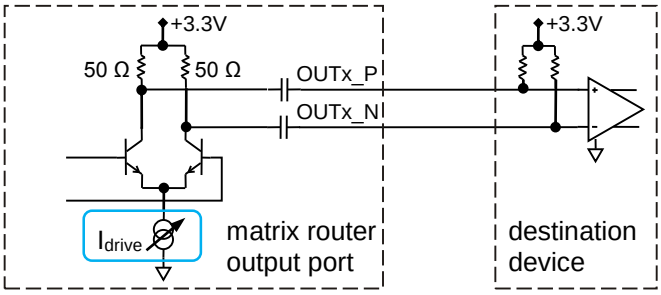


Figure 6-5. Output port drive current

Warning! *Drive currents over 24 mA should be used with extreme caution since this could damage TMDS receivers in DVI sink devices!*

6.7. Preset operations

Preset operations can be done in Crosspoint submenu on the Preset tab. Each Lightware matrix switcher has 32 preset memories that can be loaded and saved at any time.

Info: A preset setting stores a full configuration of all outputs, so preset loading have an effect on every output, except the locked ones.

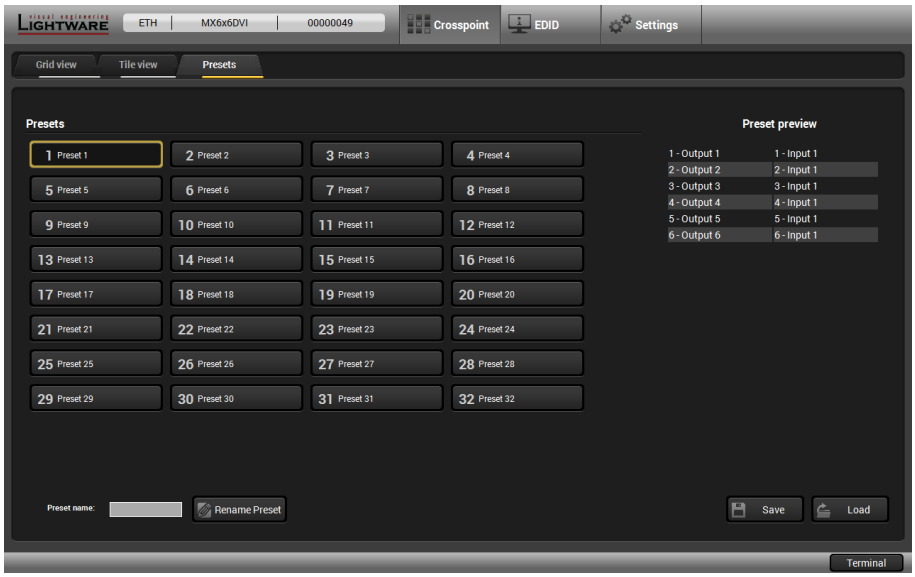


Figure 6-6. Presets tab

A preset can be selected by pressing its button on the left. Preview preset (on the right) will show the crosspoint settings of input and output ports.

Loading a preset

Step 1. Select Preset tab from Crosspoint menu.

Step 2. Select the preset memory (Preset1...Preset32) you want to load as the next crosspoint configuration.

Step 3. Press Load button below Preset preview list. Now the preset is loaded.

Step 4. The new I/O configuration is displayed in Grid view.

Saving a preset

Step 1. Make the desired crosspoint connections in Tile view or Grid view.

Step 2. Select the preset memory (Preset1...Preset32) where you want to save your current crosspoint connections.

Step 3. Press the Save button below Preset preview list.

Step 4. A confirmation message is displayed on the information bar; the preset is stored.

Renaming a preset

Step 1. Select the preset memory (Preset1...Preset32) you want to rename.

Step 2. Type the desired name and press Rename Preset button; the new name is stored.

6.8. EDID menu

Advanced EDID Management can be accessed by selecting the EDID menu.

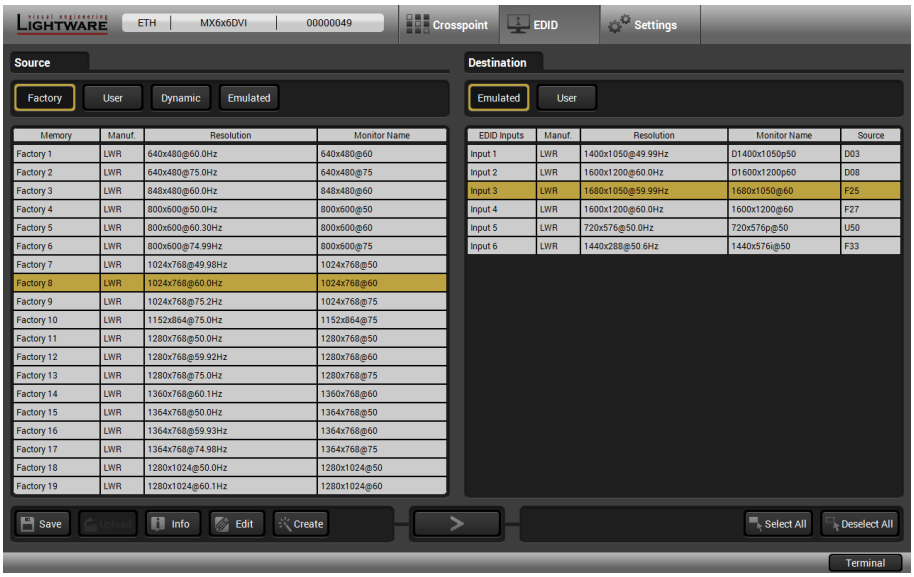


Figure 6-7. EDID menu

There are two panels: left one contains Source EDIDs, right one contains Destination places where the EDIDs can be emulated or copied. The list can be scrolled by mouse wheel or by grabbing and moving up and down.

Control buttons

Save	Exporting an EDID (save to a file)	>	Executing EDID emulation or copying (Transfer button)
Load	Importing an EDID (load from a file)	Clear selected	Deleting EDID (from user memory)
Info	Display EDID Summary window	Select All	Selecting all memory places in the right panel
Edit	Opening Advanced EDID Editor with the selected EDID	Unselect All	Selecting none of the memory places in the right panel

6.9. EDID operations

6.9.1. Changing emulated EDID

Step 1. Select the desired EDID list from one of the three sources by pressing its button.

Step 2. Select an EDID from the Source panel to emulate.

Step 3. Press Emulated button on the top of the Destination panel.

Step 4. Select desired port on the right panel (more than one ports can also be selected); the EDID(s) will be highlighted with yellow cursor.

Step 5. Press Transfer button to change the emulated EDID.

6.9.2. Learning an EDID

Info: The process is the same as changing the emulated EDID; the only difference is at the Destination panel: press the User button. Thus, one or more EDIDs can be copied into the user memory either from the factory memory or from a connected sink (Dynamic).

6.9.3. Exporting an EDID

Source EDID can be downloaded as a file (*.bin, *.dat or *.edid) to the computer.

Step 1. Select the desired EDID from the Source panel (highlighted with yellow cursor).

Step 2. Press the Save button to open the Save as dialog and download the file to the computer.

6.9.4. Importing an EDID

Previously saved EDID (*.bin, *.dat or *.edid file) can be uploaded to the user memory:

Step 1. Press the User button on the top of the Source panel.

Step 2. Select a memory slot from the Source panel.

Step 3. Press the Upload button below the Source panel.

Step 4. Browse the file in the opening window then press the Open button. Browsed EDID is imported into the selected User memory.

Info: The imported EDID overwrites the selected memory place even if it is not empty.

6.9.5. EDID Summary window

Select an EDID from Source panel and press Info button to display the EDID summary.

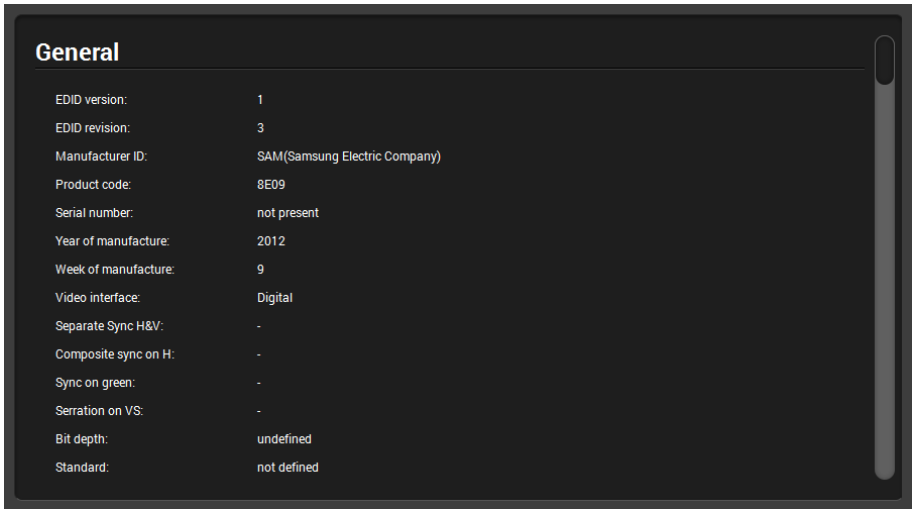


Figure 6-8. EDID Summary

6.9.6. Editing an EDID

Select an EDID from Source panel and press the Edit button to display Advanced EDID Editor window. The editor can read and write all descriptors, which are defined in the standards, including the additional CEA extensions. Any EDID from the device's memory can be loaded in the editor. The software resolves the raw EDID, and displays it as readable information to the user. The modified EDID can be saved to the User memory.

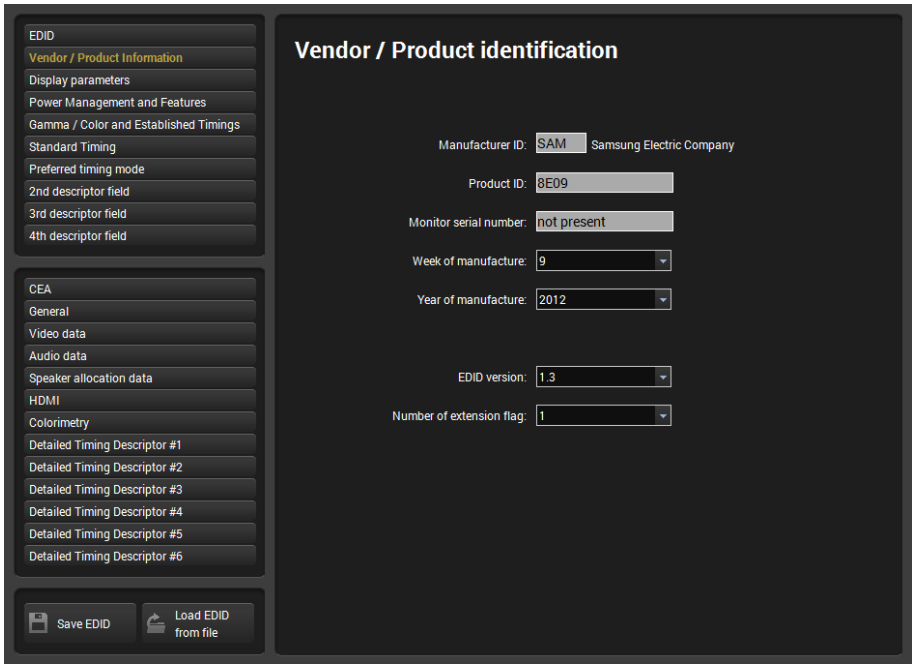


Figure 6-9. Advanced EDID Editor

6.9.7. Deleting EDID(s)

The EDID(s) from User memory can be deleted as follows:

Step 1. Press User button on the top of the Destination panel.

Step 2. Select desired memory slot(s); more can be selected (Select All and Deselect All buttons can be used). The EDID(s) will be highlighted with yellow cursor.

Step 3. Press the Clear selected button to delete the EDID(s).

6.10. Settings menu

6.10.1. Configuration tab

Settings about establishing the connection to the matrix are available on this tab.

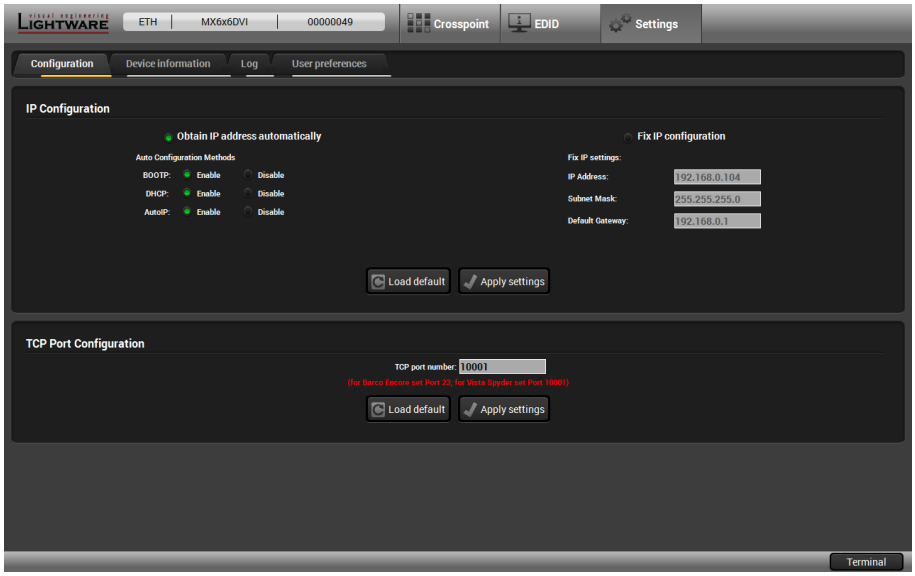


Figure 6-10. Configuration tab

IP Configuration

The IP address and TCP/IP port can be set up here.

Obtain IP address automatically

By selecting the Obtain IP address automatically option, the matrix gets the IP address from the DHCP server on the LAN. If DHCP server is not present, the device gets an AutoIP address from 169.254.xxx.xxx domain automatically. Set BOOTP, DHCP and AutoIP settings according to your network requirements. Always press the Apply settings button to save changes.

Info: Load default button restores the default network settings (fix IP) to the device: fix IP Address: 192.168.254.254, Subnet Mask: 255.255.0.0, Default Gateway: 0.0.0.0.

Info: When serial port is used for connection, these settings cannot be changed.

Fix IP configuration

In this case, connected device has an IP address configuration set up by the user/administrator. Depending on modified settings, you might need to restart the device and the Control Software. Always press the Apply settings button to save changes.

Info: Load default button restores the default network settings (fix IP) to the device: fix IP Address: 192.168.254.254, Subnet Mask: 255.255.0.0, Default Gateway: 0.0.0.0.

Info: When serial port is used for connection, these settings cannot be changed.

TCP Port Configuration

Devices can be accessed via this TCP/IP port number with TCP connection. Port number can be modified to any number between 1025 and 65535 except the followings:

9999, 14000 - 14009, 30704, and 30718.

To use a matrix with Barco Encore set port to 23.

To use a matrix with Vista Spyder set port to 10001.

Always press the Apply settings button to save changes.

6.10.2. Device information tab

The following information can be found on this tab: Device type, Serial number, MAC address and the installed cards with hardware- and firmware versions.

6.10.3. Log tab

Report section

Generate report

LDC is able to collect information from the matrix and save it to a report file. This information package can be sent to Lightware when a problem may arise with the device.

Info: When a report is necessary to generate, always let the devices be connected to the matrix, do not disconnect them. The Controller Software will collect information about the devices and about their status.

Step 1. Press the big red button on the Log tab in the Settings menu: Generate report file.

Step 2. The Save as dialog box appears. Select the place where you want to save the report file. The default file name can be changed.

Step 3. LDC collects the needed information. This may take up to 5 minutes.

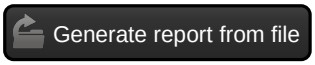
Step 4. When the process is finished, the folder is opened, where the file was saved.

The report contains the following information:

- Current command protocol
- The equipment type and serial number
- Current crosspoint state
- Firmware versions of the internal controllers
- Installed I/O board types and versions

Browse command file

The Controller Software is able to send a custom command file to the extender. The command file can be generated by Lightware support. This is needed when some special commands has to be used for configuring or troubleshooting.



Info: This function is only for special troubleshooting cases.

Error log viewer

Log files saved by the matrix can be downloaded and viewed with this function. The columns in the list are the followings: error level, time, error code, error parameter, processor task identifier, occurrences and extra information.

The device creates a new error log file every time it is started except if there is already a log file created for that day. The software allows to select only months and days, which have a log.

Step 1. Select the month of the error log.

Step 2. Select the day.

Step 3. The error log is downloaded and shown as a table.

Step 4. The error log can be saved in a CSV file on the computer by the Export to CSV file button.

Logs can be deleted one-by-one or all the logs at the same time with the Delete all logs and Delete this log buttons.

6.11. Terminal

The terminal is created mainly for testing and debugging purposes. The terminal is available via serial RS-232 or TCP/IP LAN connection. The command text can be typed directly. Press Terminal button in the right bottom corner to open the window.

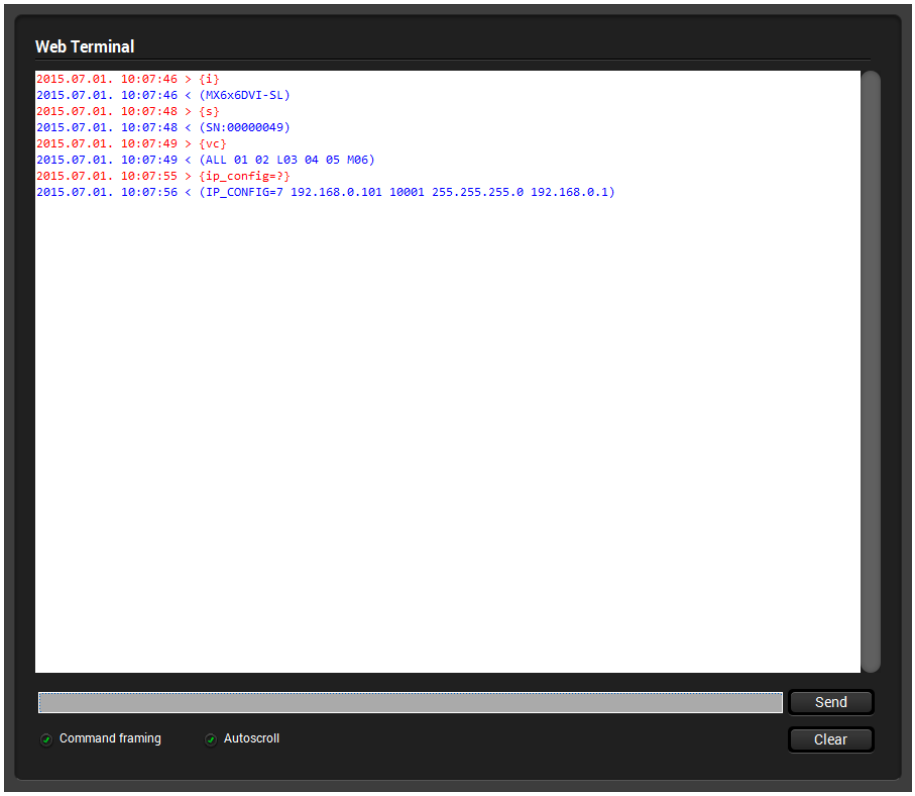


Figure 6-11. Terminal window

Commands are automatically surrounded by framing brackets by default. Every sent command is red-colored and gets a '>' prefix. Received responses are blue-colored and starts with '<'.

The timecode in every row shows the exact time when the command was sent or the response received.

If the Command framing checkbox is unchecked, you can send multiple commands together, however in this case you have to type in the framing brackets manually.

If the Autoscroll checkbox is checked, the window is scrolled down automatically when a new row is added.

The window can be emptied by pressing the Clear button.

6.12. Device discovery (information ribbon)

This label shows the interface type, the name and the serial number of the connected device. The Device discovery window can be started by clicking on this ribbon. Clicking Yes will open the window. See section 6.4 on page 30 how to establish the connection. Clicking No will close the pop up window and current connection remains active.

ETH	MX6x6DVI	00000049

7. Web control – Using the built-in website

7.1. Accessing the router's built-in website

Lightware matrices have a built-in web page, which can be accessed over TCP/IP protocol and offers you full control over all settings even if you don't have the opportunity to install new programs. The router's built-in website is compatible with most widely spread browsers and requires no additional software components such as ActiveX controls. The web interface functionality has been tested and confirmed with the most used browsers (Mozilla Firefox, Internet Explorer, Opera, Safari and Google Chrome).

To access the webpage just run your preferred web browser and type the IP address of the router as URL. The computer and the router have to be in the same subnet.

Info: The only way to find out the router's IP address (if it is not known) is to search for devices with the Lightware Device Controller software. If this is not possible for some reason, the IP address can be reset to factory default (192.168.254.254) with the front panel buttons. See section 4.3.2 on page 24 for more information.

Info: Only one opened web page is allowed simultaneously. Other TCP/IP connections are prohibited while the web page is opened. Using more instances of the web page simultaneously will result in inadequate operations.

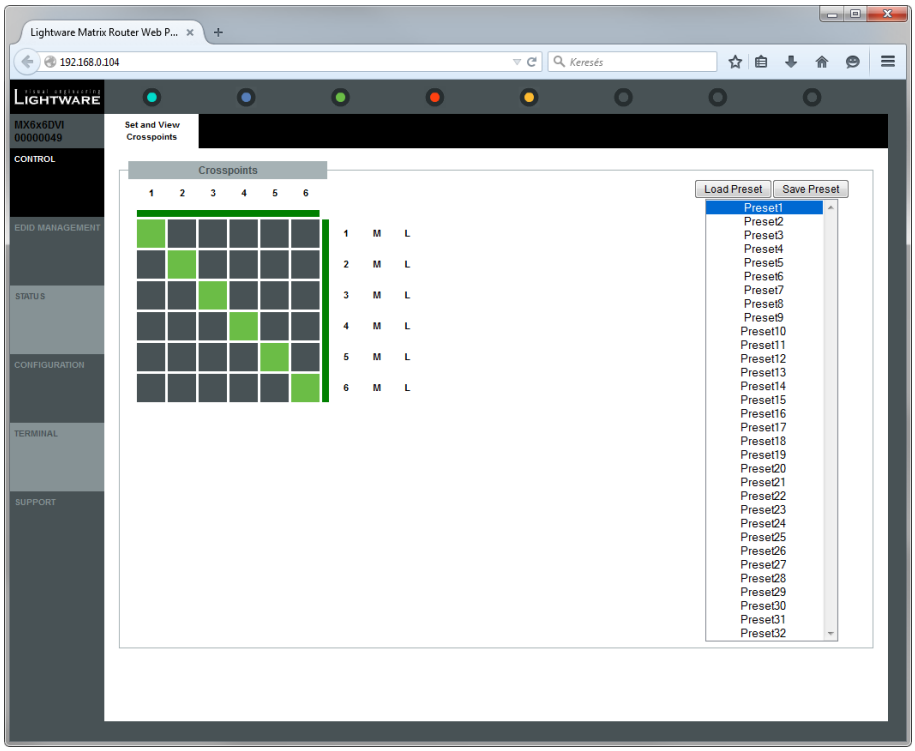


Figure 7-1. Built-in website main page

7.2. Control menu

7.2.1. Crosspoint switching

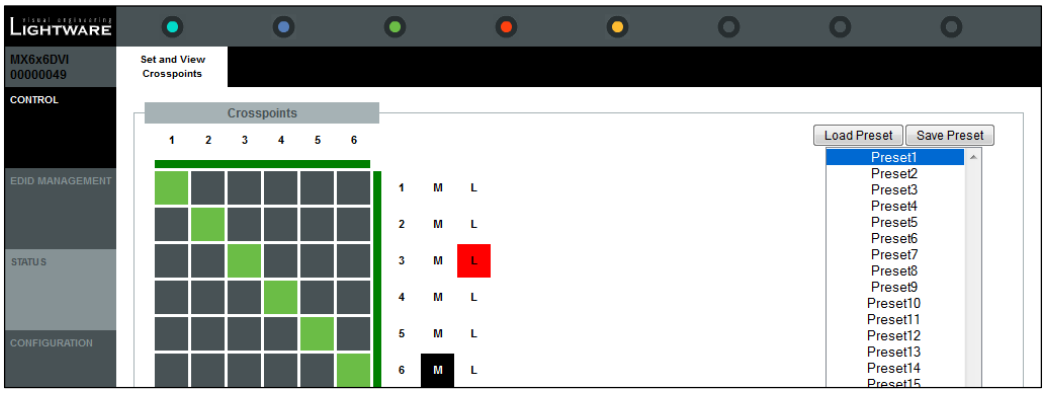


Figure 7-2. Built-in website crosspoint array

1; 2; 3... columns represent the inputs, and the 1; 2; 3... rows represent the outputs. Each green square represents a live connection. For making a connection click on the desired grey square.

Mute outputs

Outputs can be easily muted by clicking the button titled 'M' beside the output. This means that no signal will be present at this output.

Important! *If CPU FW version 1.4.8 is installed in the matrix, the muted output will be unmuted when an input is switched to the destination. If CPU FW 2.4.4 or above is installed in the matrix, the switching does not change mute state. See appendix in section 12.1 on page 76 for more information.*

Lock outputs

Outputs can be locked to any inputs. After locking an input to an output no switching is permitted for this output unless it is unlocked again.

Info: *Loading a preset does not change neither the lock state nor the switch state of a locked output. If an output is locked to an input before preset loading, it will also be locked that input after preset loading, so locked outputs ignore the preset.*

7.2.2. Preset operations

Preset operations can be done in the right panel of the Control → Set and View Crosspoints page. Each Lightware matrix switcher has 32 preset memories that can be loaded and saved any time.

Front panel Preset operations effect only the first 8 preset memories, all others from 9 to 32 are available only via the Device Controller software or the router's built-in website.

Save Preset

Step 1. Make the desired configuration on matrix switching area.

Step 2. Select the desired preset memory location (Preset1...Preset32).

Step 3. Press Save Preset button. Now a message box appears that the preset is stored.

Load Preset

Step 1. Highlight the preset memory location (Preset1...Preset32) you want to load as next configuration.

Step 2. Press Load Preset button. Now the preset is loaded.

Step 3. The new I/O configuration is displayed on the matrix switching area.

7.2.3. Output settings

Click on Control menu then select Output settings. This menu contains advanced settings for output parameters.

Info: Some settings are only accessible with Lightware PRO series routers.

Scope of changes

The affected output can be selected in the top box, or changes can be applied to all outputs. To set the scope of the changed settings, select the desired option in the top left box.

- Apply changes to current output: The modified parameters are applied only to the currently selected port.
- Apply changes to all outputs: The modified parameters are applied to all output ports.

Info: After closing this window, the Current Output option will be selected regardless of which was active at the time of closing. It is to avoid setting All Outputs by mistake.

Reload factory defaults

- Current output: Reloads the default values to the currently selected output.
- All outputs: Loads the factory default values to all outputs.

Drive current

It specifies the drive current of the internal crosspoint circuit for each output. It is recommended to leave this value at the default 20 mA setting, this produces differentially 1 V peak to peak voltage conforming DVI specification. Alter only if experiencing signal transmission errors. Higher output drive currents can help to avoid problems when using longer cables. Modifications are done promptly when selecting a value from the drop down list.

To obtain a standard 1000 mV p-p differential output (single-ended = 500 mV p-p), the output current should be programmed to 20 mA. With an effective termination resistance of 25 Ω, this will generate the proper differential voltage.

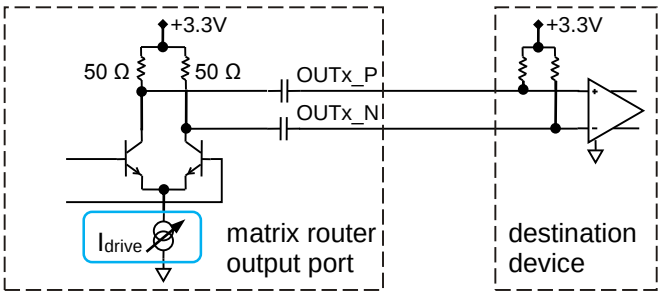


Figure 7-3. Output port drive current

Warning! Drive currents over 24 mA should be used with extreme caution since this could damage TMDS receivers in DVI sink devices!

7.3. EDID Management menu

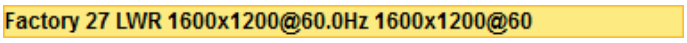
When the user enters the menu first, the whole EDID list is being downloaded from the matrix. It may take up to 20 seconds for the first time. After the EDIDs are downloaded, two EDID lists are displayed. The content can be set by the user from the followings:

- Emulated EDID list: It contains the resolutions and the vendor names of the EDID reported to the source for each input separately.
- Last attached Monitor's EDID list: It contains the resolutions and vendor names of the display devices connected to matrix switcher's output.
- Factory EDID lists: Factory pre-programmed EDIDs with the most common resolutions (cannot be modified).
- User memory: User programmable EDID memories.

7.3.1. Change emulated EDID at one or all inputs

Step 1. Select the desired EDID lists to the two windows.

Step 2. Click on the EDID that will be copied (emulated) to the desired place. The selected EDID will be displayed in a small yellow window at the mouse cursor:



Step 3. To switch (emulate) the EDID

a) on a certain input, click on it in the other EDID list window;

b) on ALL in inputs, click on the Switch to all input button on the bottom.

To cancel the operation click on the Cancel button.

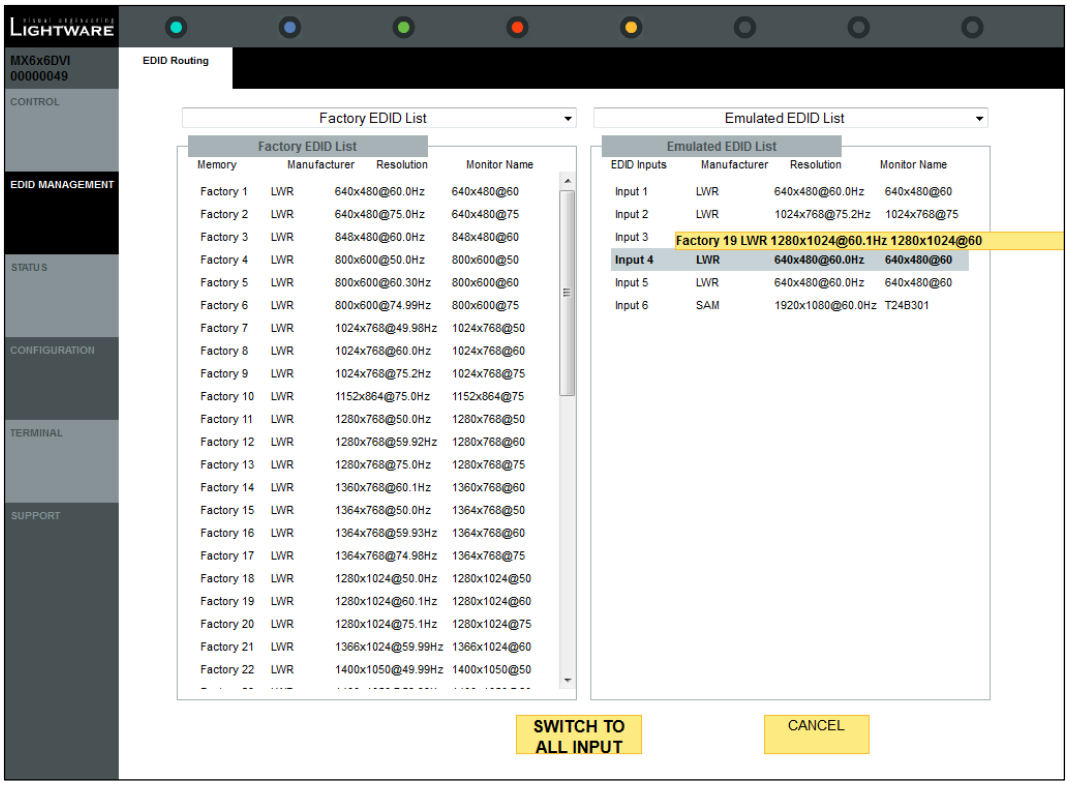

LIGHTWARE
MX6x6DVI
00000049
CONTROL
EDID MANAGEMENT
STATUS
CONFIGURATION
TERMINAL
SUPPORT
EDID Routing
Factory EDID List
Emulated EDID List
Factory EDID List
Memory Manufacturer Resolution Monitor Name
Factory 1 LWR 640x480@60.0Hz 640x480@60
Factory 2 LWR 640x480@75.0Hz 640x480@75
Factory 3 LWR 848x480@60.0Hz 848x480@60
Factory 4 LWR 800x600@50.0Hz 800x600@50
Factory 5 LWR 800x600@60.30Hz 800x600@60
Factory 6 LWR 800x600@74.99Hz 800x600@75
Factory 7 LWR 1024x768@49.98Hz 1024x768@50
Factory 8 LWR 1024x768@60.0Hz 1024x768@60
Factory 9 LWR 1024x768@75.2Hz 1024x768@75
Factory 10 LWR 1152x864@75.0Hz 1152x864@75
Factory 11 LWR 1280x768@50.0Hz 1280x768@50
Factory 12 LWR 1280x768@59.92Hz 1280x768@60
Factory 13 LWR 1280x768@75.0Hz 1280x768@75
Factory 14 LWR 1360x768@60.1Hz 1360x768@60
Factory 15 LWR 1364x768@50.0Hz 1364x768@50
Factory 16 LWR 1364x768@59.93Hz 1364x768@60
Factory 17 LWR 1364x768@74.98Hz 1364x768@75
Factory 18 LWR 1280x1024@50.0Hz 1280x1024@50
Factory 19 LWR 1280x1024@60.1Hz 1280x1024@60
Factory 20 LWR 1280x1024@75.1Hz 1280x1024@75
Factory 21 LWR 1366x1024@59.99Hz 1366x1024@60
Factory 22 LWR 1400x1050@49.99Hz 1400x1050@50
Emulated EDID List
EDID Inputs Manufacturer Resolution Monitor Name
Input 1 LWR 640x480@60.0Hz 640x480@60
Input 2 LWR 1024x768@75.2Hz 1024x768@75
Input 3 Factory 19 LWR 1280x1024@60.1Hz 1280x1024@60
Input 4 LWR 640x480@60.0Hz 640x480@60
Input 5 LWR 640x480@60.0Hz 640x480@60
Input 6 SAM 1920x1080@60.0Hz T24B301
SWITCH TO ALL INPUT
CANCEL

Figure 7-4. EDID management

Info: Switching to ALL inputs may take several seconds.

The user can switch and learn EDIDs also in the **Last Attached Monitors EDIDs** window. Switching an EDID from this list to an input results dynamic EDID routing. This means that the emulated EDID changes automatically, if a new monitor is attached to the output, by simply copying the data from the monitor.

7.4. Status menu

Basic device information, such as the installed cards' firmware and hardware revisions are displayed in this window.

Report section

Generate report

The built-in web also allows to get information from the matrix and save it to a report file. This information package can be sent to Lightware when a problem may arise with the device.

Info: When a report is necessary to generate, always let the devices be connected to the matrix, do not disconnect them.

Step 1. Press the big red button on the bottom; the report is being generated.

Step 2. When the report is ready click on the info box to download it.

The report contains the following information:

- Current command protocol
- The equipment type and serial number
- Current crosspoint state
- Firmware versions of the internal controllers
- Installed I/O board types and versions

Custom report

Custom command file can be created and sent to the extender. The file is generated by Lightware support. This is needed when some special commands has to be used for configuring or troubleshooting.

Info: This function is only for special troubleshooting cases.

7.5. Configuration menu

The unit's network values are displayed when you select Configuration → Network Settings.

Info: It is possible to reload factory default IP setup using the front panel buttons. See section 4.3.2 on page 24.

7.5.1. IP configuration

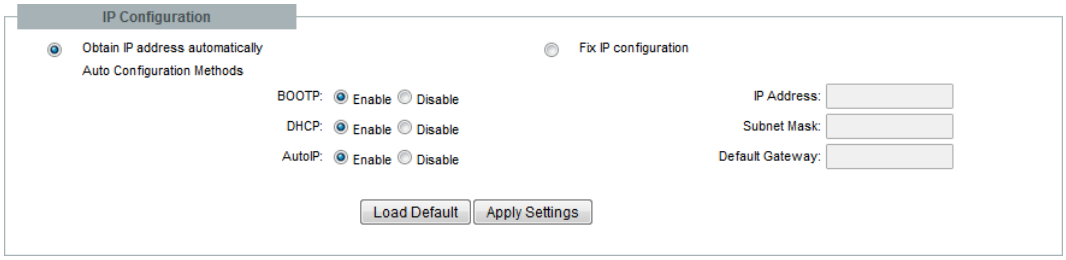
To assign IP address automatically

The matrix switcher supports three of the most used automatic IP configuration protocols.

Step 1. Click on Configuration menu and Network Settings tab.

Step 2. Select Obtain IP address automatically.

Step 3. Enter the following (as necessary):



- **BOOTP:** Select Enable to permit the Bootstrap Protocol (BOOTP) server to assign the IP address from a pool of addresses automatically.
- **DHCP:** Select Enable to permit the Dynamic Host Configuration Protocol (DHCP) server to assign leased IP address to the matrix unit automatically.
- **AutoIP:** Select Enable to permit the matrix to generate an IP in the 169.254.x.x address range with Class B subnet.

Info: Disabling BOOTP, DHCP, and AutoIP (all three checkboxes) is not advised as the only available IP assignment method will then be ARP or serial port.

Step 4. When you are finished, click Apply Settings button.

Info: To continue using the website, you must type the new IP address in the browser.

To assign an IP address manually

The IP address can be also set manually and enter the related network settings.

Step 1. Click on Configuration menu and Network Settings tab.

Step 2. Select Fix IP Configuration.

Step 3. Enter the followings (as necessary):

- **IP Address:** If DHCP is not used to assign IP addresses, enter it manually in decimal-dot notation. The IP addresses must be set to a unique value in the network.
- **Subnet Mask:** A subnet mask defines the number of bits taken from the IP address that are assigned for the host part.
- **Default Gateway:** The gateway address, or router, allows communication to another LAN segments. The gateway address should be the IP address of the router connected to the same LAN segment as the matrix. The gateway address must be within the local network.

Step 4. When you are finished, click Apply Settings button.

Info: To continue using the website, you must type the new IP address in the browser.

Loading the default IP settings

Step 1. Click on the Load Default button. Now the factory default IP address, Subnet Mask and Gateway address is loaded into the input boxes. But they are not saved.

Step 2. To save the settings, click on Apply Settings button.

Step 3. The default fix IP settings are applied:

IP Address:	192.168.254.254
Subnet Mask:	255.255.0.0
Default Gateway:	0.0.0.0

7.5.2. TCP Port Configuration

The user can configure the TCP port number, which is used to communicate with the matrix router through LAN. The input box initially contains the current setting.

Step 1. Type the desired TCP port number into the input box.

Step 2. Press the Apply Settings button. The new port will be active after the next connection.

Loading the default TCP Port settings

Step 1. Click on Load Default button. Now the factory default value is in the input box, but it is not saved.

Step 2. To save, click on Apply Settings button. The new port will be active after the next connection.

7.6. Terminal menu

This general terminal window is intended mainly for testing and debugging purposes. All commands can be used here that are discussed in the programmer's reference. The command text can be typed directly.

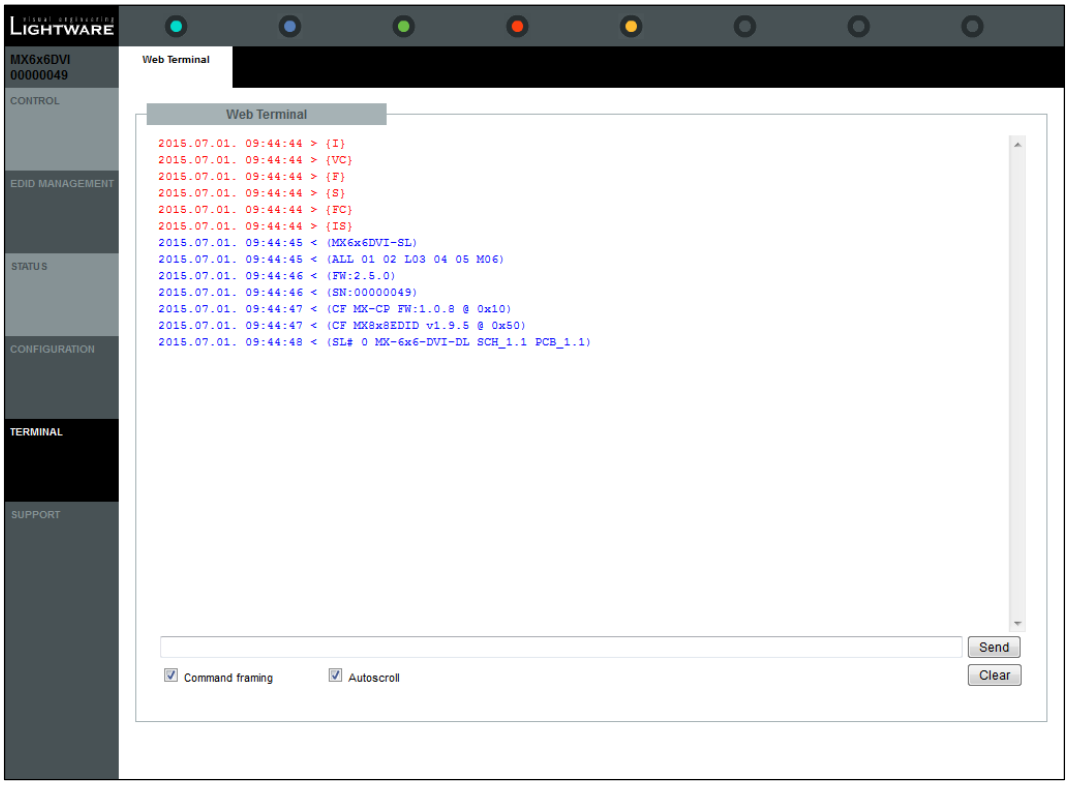


Figure 7-5. Terminal window

By default commands are automatically surrounded by framing brackets. Every sent command and every received response gets an arrow (-> or <-) prefix, and has different font colors in order to help distinguishing.

The timecode in every row shows the exact time when the command was sent or the response received.

If the 'Command framing' checkbox is unchecked, you can send multiple commands together, however in this case you have to type in the framing brackets manually.

7.7. Support

For technical support, please don't hesitate to contact Lightware Visual Engineering at support@lightware.eu.

8. Programmer's reference

Users can connect the matrix through Ethernet, or serial port as well. After establishing connection, there is no difference between connection types (except some rare cases, which are uniquely noted).

Lightware matrix routers can be controlled with external devices which can communicate according to the router protocol. Lightware routers have a special protocol, but to interoperate with third party devices, a secondary protocol is also provided.

8.1. Changing and viewing protocols

The router is equipped with multiple router protocols.

Step 1. Switch the router to TAKE mode if used previously in AUTOTAKE mode by pressing TAKE button for 4 seconds. (light will go off)

Step 2. Press and release Control Lock (Control Lock button lights in up red continuously)

Step 3. Press and keep pressed the Output Lock button. Now one of the source buttons will light up according to the current protocol (view protocol):

Step 4. If Source#1 button lights: Lightware protocol is active

Step 5. If Source#2 button lights: Protocol#2 is active

Step 6. If you do not want to change the protocol, release the Output Lock button. (view only)

Step 7. If you want to change the protocol, keep the Output Lock button pressed, and press the desired Source button, accordingly to the new protocol. The desired Source button starts blinking, the router performs a reset straight away and all buttons light up for 3 seconds. Now the new protocol is active.

8.2. Protocol description

The protocol description hereinafter stands for Lightware protocol.

The matrices accept commands surrounded by curly brackets - { } - and responds data surrounded by round brackets - ( ) - only if a command was successfully executed. All input commands are converted to uppercase, but respond commands can contain upper and lower case letters as well.

Legend for control commands:

<in>	=	input number in 1 or 2 digit ASCII format (01,5,07,16 etc.)
<out>	=	output number in 1 or 2 digit ASCII format
<in²>	=	input number in 2 digit ASCII format (01, 02, 10, 12 etc.)
<out²>	=	output number in 2 digit ASCII format (01, 02, 10, 12 etc.)
<loc>	=	location number in 1, 2 or 3 digit ASCII format
<id>	=	id number in 1 or 2 digit ASCII format
<id²>	=	id number in 2 digit ASCII format
CrLf	=	Carriage return, Line feed (0x0D, 0x0A)
●	=	space character (0x20)
→	=	each command issued by the controller
←	=	each response received from the router

8.3. Switching and control commands

8.3.1. Switch one input to one output

Description: Switch input <in> to output <out>.

Format	Example
Command {<in>@<out>}	→ {1@5}
Response (O<out²>●I<in²>)CrLf	← (O05 I01)CrLf

Explanation: Input 1 is switched to output 5.

Important! *If CPU FW version 1.4.8 is installed in the matrix, the muted output will be unmuted when an input is switched to the destination. If CPU FW 2.5.0 or above is installed in the matrix, the switching does not change mute state. See appendix in section 12.1 on page 76 for more information.*

8.3.2. Switch one input to all outputs

Description: Switch input <in> to all outputs.

Format	Example
Command {<in>@O}	→ {02@O}
Response (I<in²>●ALL)CrLf	← (I01 ALL)CrLf

Explanation: Input 2 is switched to all outputs.

Important! *If CPU FW 1.4.8 version is installed in the matrix, the muted output will be unmuted when an input is switched to the destination. If CPU FW 2.5.0 or above is installed in the matrix, the switching does not change mute state. See appendix in section 12.1 on page 76 for more information.*

8.3.3. View connection on the specified output

Info: *Obsolete! Use {VC} instead.*

Description: View connection on output <out>.

Format	Example
Command {?<out>}	→ {?05}
Response (O<out²>●I<in²>)CrLf	← (O05 I01)CrLf

Explanation: Viewing connection for output 5. The connected input is 1.

8.3.4. View connection on all outputs

Description: Viewing all outputs' connection results in different response length, because it depends on the router's type (length = 8 for MX8x8DVI / MX8x8DVI-DL, length = 6 for MX6x6DVI / MX6x6DVI-DL). The response below supposes a router having 8 outputs.

Format		**Example 1** (MX8x8)
Command	{VC}	→ {VC}
Response	(ALL●<O1>●<O2>●<O3>●<O4>●<O5>●<O6>●<O7>●<O8>)CrLf	← (ALL 02 02 02 05 05 05 08 08)CrLf

Legend 1: All <Ox> indexes show the corresponding output's connection state. If value <O5> equals 04 it means that output 5 is connected to input 4. <O1>..<O8> are two digit ASCII characters. (01, 02, 04, etc.)

Explanation 1: Viewing connection for all outputs. Input 2 is connected to outputs 1, 2 and 3. Input 5 is connected to outputs 4, 5 and 6. Input 8 is connected to output 7 and 8.

Important! *If CPU FW version 1.4.8 is installed in the matrix, an extra space character is sent after the last output: (ALL●<O1>●<O2>●<O3>●<O4>●<O5>●<O6>●<O7>●<O8>●). See appendix in section 12.1 on page 76 for more information.*

Info: *If an output is locked, muted, or both locked and muted, the response format changes. If outputs are muted you get a letter 'M', if locked a letter 'L' and if muted and locked at the same time 'U' before the 2 digit numbers.*

Format		Example 2 (MX8x8)
Command	{VC}	→ {VC}
Response	(ALL●<O1>●<O2>●<O3>●<O4>●<O5>●<O6>●<O7>●<O8>)CrLf	← (ALL M02 L02 U02 05 05 05 08 08)CrLf

Legend 2: Any <Ox> indexes can be a two digit number, or there can be a leading character showing the mute and/or lock state for the corresponding output.

Index	Legend	Explanation
<Ox>	<in²>	<Ox> is connected to <in²>, <Ox> neither muted or locked.
<Ox>	M<in²>	<Ox> is connected to <in²>, <Ox> is muted, and unlocked.
<Ox>	L<in²>	<Ox> is connected to <in²>, <Ox> is not muted, but locked.
<Ox>	U<in²>	<Ox> is connected to <in²>, <Ox> is muted and locked.

Explanation 2: Viewing connection for all outputs. Input 2 is connected to outputs 1, 2 and 3. Output 1 is muted. Output 2 is locked. Output 3 is muted and locked. Input 5 is connected to outputs 4, 5 and 6. Input 8 is connected to output 7 and 8.

8.3.5. View mutes on all outputs

Description: Viewing all outputs' connection results in different response length, because it depends on the router's type (length = 8 for MX8x8DVI / MX8x8DVI-DL, length = 6 for MX6x6DVI / MX6x6DVI-DL). The response below supposes a router having 8 outputs.

Format		Example (MX8x8)
Command	{VM}	→ {VM}
Response	(MUT●<M1>●<M2>●<M3>●<M4>●<M5>●<M6>●<M7>●<M8>)CrLf	← (MUT 1 0 1 1 0 0 0 0)CrLf

Legend: All <Mx> indexes are one digit numbers, showing the mute state for the corresponding output. If <Mx> equals 0 the output x is unmated. If <Mx> equals 1, the output x is muted.

Explanation: Output 1, 3 and 4 are muted, the other outputs are not muted.

8.3.6. Mute specified output

Description: Mute output <out>.

Format		Example
Command	{#<out>}	→ {#03}
Response	(1MT<out²>)CrLf	← (1MT03)CrLf

Explanation: Output 3 is muted. Now no signal presents on output 3.

8.3.7. Unmute specified output

Description: Unmute output <out>.

Format	Example
Command {+<out>}	→ {+03}
Response (0MT<out²>)CrLf	← (0MT03)CrLf

Explanation: Output 3 is unmuted. Now output 3 is switched to the input it was connected to prior to the mute command.

Important! *If CPU FW version 1.4.8 is installed in the matrix, the muted output will be unmuted when an input is switched to the destination. If CPU FW 2.5.0 or above is installed in the matrix, the switching does not change mute state. See appendix in section 12.1 on page 76 for more information.*

8.3.8. Lock specified output

Description: Lock output <out>. Output's state cannot be changed until unlocking.

Format	Example
Command {#><out>}	→ {#>05}
Response (1LO<out²>)CrLf	← (1LO05)CrLf

Explanation: Output 5 is locked.

8.3.9. Unlock specified output

Description: Unlock output <out>. Now output 3 state can be changed.

Format	Example
Command {+<<out>}	→ {+<05}
Response (0LO<out²>)CrLf	← (0LO05)CrLf

Explanation: Output 5 is unlocked.

Info: *The router issues the above response regardless of the previous state of the output (either it was locked or unlocked).*

8.3.10. Save preset to the specified memory location

Description: Save current crosspoint configuration (output states) to preset <id>.

Format	Example
Command {$<id>}	→ {$4}
Response (SPR<id²>)CrLf	← (SPR04)CrLf

Explanation: Current crosspoint state is saved to preset 4, including the mute state of the outputs.

Info: *Lock states are not saved. Lock state is assigned to the physical output of the router. Presets don't affect output locks.*

8.3.11. Load preset from the specified location

Description: Load preset <id>.

Format	Example
Command {%<id>}	→ {%4}
Response (LPR<id²>)CrLf	← (LPR04)CrLf

Explanation: Current crosspoint state is changed according to preset 4, including the mute state of the outputs.

Info: Lock states are not loaded. Lock state is assigned to the physical output of the router. Presets don't affect output locks.

8.3.12. Preview preset

Description: Preview preset <id> without loading.

Format		Example (MX8x8)
Command	{VP#<id>=?}	→ {VP#3=?}
Response	(VP#<id>=●<O1>●<O2> ●<O3>●<O4>●<O5>●<O6> ●<O7> ●<O8>●)CrLf	← (VP#3= 02 M02 M01 02 02 01 01 01)CrLf

Legend: Any <Ox> indexes can be a two digit number, or there can be a leading character showing the mute state for the corresponding output.

Explanation: Viewing connections for preset 3. Input 2 is connected to outputs 1, 2, 4 and 5. Input 1 is connected to outputs 3, 6, 7 and 8. Output 2 and 3 are muted. The shown input connections for these outputs are not active, but the last connection that was routed to that output before it was muted.

Index	Legend	Explanation
<Ox>	<in²>	<Ox> is connected to <in²>, <Ox> is not muted.
<Ox>	M<in²>	<Ox> is connected to <in²>, <Ox> is muted.

Important! Above mentioned command is not supported by CPU FW version 1.4.8. See appendix in section 12.1 on page 76 for more information.

8.3.13. Renaming Presets / Inputs / Outputs

Description: Allows storing names for each preset / input / output. Any 16-byte long string is allowed. All characters are converted to uppercase! The router accepts <id> greater than the current I/O setup but treats it as modulo output. So if <id> = 9 on a 8x8 router, then it will be treated as 1. All router models have 32 presets memories.

Rename a preset

Format		Example
Command	{PNAME#<id>= <preset_name>}	→ {PNAME#1=first preset}
Response	(PNAME#<id>= <preset_name>)CrLf	← (PNAME#1=FIRST PRESET)CrLf

Explanation: Preset 1 was named as "first preset".

Important! Above mentioned command is not supported by CPU FW version 1.4.8. See appendix in section 12.1 on page 76 for more information.

Rename an input

Format		Example
Command	{INAME#<id>= <input_name>}	→ {INAME#3=Media Player}
Response	(INAME#<id>= <input_name>)CrLf	← (INAME#3=MEDIA PLAYER)CrLf

Explanation: Input 3 was named as “media player”.

Important! *Above mentioned command is not supported by CPU FW version 1.4.8. See appendix in section 12.1 on page 76 for more information.*

Rename an output

Format	Example
Command {ONAME#<id>= <output_name>}	→ {ONAME#2=Monitor_no2}
Response (ONAME#<id>= <output_name>)CrLf	← (ONAME#2=MONITOR_NO2)CrLf

Explanation: Output 2 was named as “monitor_no2”.

Important! *Above mentioned command is not supported by CPU FW version 1.4.8. See appendix in section 12.1 on page 76 for more information.*

8.3.14. Query names of Presets / Inputs / Outputs

Description: Each preset / input / output name can be read from the router.

Read a preset’s name

Format	Example
Command {PNAME#<id>=?}	→ {PNAME#1=?}
Response (PNAME#<id>= <preset_name>)CrLf	← (PNAME#1=FIRST PRESET)CrLf

Explanation: Name for preset 1 is “first preset”.

Important! *Above mentioned command is not supported by CPU FW version 1.4.8. See appendix in section 12.1 on page 76 for more information.*

Read an input’s name

Format	Example
Command {INAME#<id>=?}	→ {INAME#3=?}
Response (INAME#<id>= <input_name>)CrLf	← (INAME#3=MEDIA PLAYER)CrLf

Explanation: Name for input 3 is “media player”.

Important! *Above mentioned command is not supported by CPU FW version 1.4.8. See appendix in section 12.1 on page 76 for more information.*

Read an output’s name

Format	Example
Command {ONAME#<id>=?}	→ {ONAME#2=?}
Response (ONAME#<id>= <output_name>)CrLf	← (ONAME#2=MONITOR_NO2)CrLf

Explanation: Name for output 2 is “monitor_no2”.

Important! *Above mentioned command is not supported by CPU FW version 1.4.8. See appendix in section 12.1 on page 76 for more information.*

8.3.15. Set default names of Presets / Inputs / Outputs

Description: Renames **all** preset / input / output names to the default: Preset 1..32 / Input 1.. / Output 1.. respectively.

Info: The <id> field is not relevant here, only has to be a valid one. The command will affect ALL Presets / Inputs / Outputs disregarding the actual number that was in the command.

Reload default preset names

Format	Example
Command {PNAME#<id>=!}	→ {PNAME#2=!}
Response (PNAME#<id>= Preset<id>)CrLf	← (PNAME#2=Preset 2)CrLf

Important! Above mentioned command is not supported by CPU FW version 1.4.8. See appendix in section 12.1 on page 76 for more information.

Reload default input names

Format	Example
Command {INAME#<id>=!}	→ {INAME#4=!}
Response (INAME#<id>= Input<id>)CrLf	← (INAME#4=Input 4)CrLf

Important! Above mentioned command is not supported by CPU FW version 1.4.8. See appendix in section 12.1 on page 76 for more information.

Reload default output names

Format	Example
Command {ONAME#<id>=!}	→ {ONAME#3=!}
Response (ONAME#<id>= Output<id>)CrLf	← (ONAME#3=Output 3)CrLf

Important! Above mentioned command is not supported by CPU FW version 1.4.8. See appendix in section 12.1 on page 76 for more information.

8.3.16. Reload factory default output setup

Description: Reload factory default output drive currents.

Format	Example
Command {r00}	→ {r00}
Response (APWSE)CrLf	← (APWSE)CrLf

Important! If CPU FW version 1.4.8 is installed in the matrix, the response is not above mentioned but be the following: (DVP FF FF FF FF FF FF 05). See appendix in section 12.1 on page 76 for more information.

8.3.17. Query IP settings

Description: IP setup can be retrieved from the router with this command.

Format		Example
Command	{IP_CONFIG=?}	→ {IP_CONFIG=?}
Response	(IP_CONFIG=<id> ●<ip_address>●<port> ●<mask>●<gateway>)CrLf	← (IP_CONFIG=0 192.168.2.106 10001 255.0.0.0 192.168.2.1)CrLf

Legend:

Identifier	Description	Default value
<id>	0-fix IP, 7-DHCP	0
<ip_address>	IP address	192.168.254.254
<port>	IP port of the router	10001
<mask>	subnet mask	255.255.0.0
<gateway>	gateway address	0.0.0.0

Explanation: The router has a fix 192.168.2.106 IP address on the 255.0.0.0 subnet with a gateway on 192.168.2.1 and communicates over port no. 10001.

Important! *Above mentioned command is not supported by CPU FW version 1.4.8. See appendix in section 12.1 on page 76 for more information.*

Info: *If the matrix responds only zeros for this command, please unplug from power source, reconnect and try again.*

8.3.18. Reload factory default IP settings

Description: After issuing this command over serial connection the router will reload the factory default IP setup.

Format		Example
Command	{IP_CONFIG=!}	→ {IP_CONFIG=!}
Response	(Changing IP configuration…)CrLf (DONE!)CrLf ***or*** (FAILED!)CrLf	← (Changing IP configuration…)CrLf (DONE!)CrLf ***or*** (FAILED!)CrLf

Parameters after successful command execution: (it takes about 20 seconds)

Parameter	Value
IP address	192.168.254.254
port number	10001
Subnet mask	255.255.0.0
Gateway	0.0.0.0

Important! *Above mentioned command is not supported by CPU FW version 1.4.8. See appendix in section 12.1 on page 76 for more information.*

Info: *IP settings can NOT be changed with this protocol command via Ethernet connection, only via serial port. To change the IP settings via Ethernet, use the Lightware Device Controller software (see section 6.10.1 on page 41) or the built-in website (see section 7.5 on page 48). Default setting can be reloaded by the front panel buttons as well (see section 4.3.2 on page 24).*

8.3.19. Load DHCP IP settings (only IP address!)

Description: After issuing this command over serial connection the router will inquire IP address with DHCP.

Format	Example
Command {IP_CONFIG=D} Response (Changing IP configuration…)CrLf (DONE!)CrLf or (FAILED!)CrLf	→ {IP_CONFIG=D} ← (Changing IP configuration…)CrLf (DONE!)CrLf or (FAILED!)CrLf

Parameters after successful command execution:

Parameter	Value
IP address	Acquired with DHCP
port number	unchanged
Subnet mask	unchanged
Gateway	unchanged

Important! *Above mentioned command is not supported by CPU FW version 1.4.8. See appendix in section 12.1 on page 76 for more information.*

Info: *IP settings can NOT be changed with this protocol command via Ethernet connection, only via serial port. To change the IP settings via Ethernet, use Lightware Device Controller software (see section 6.10.1 on page 41.) or the built-in website (see section 7.5 on page 48). DHCP can be enabled by the front panel buttons as well (see section 4.3.2 on page 24).*

8.4. Router Status commands

8.4.1. View product type

Description: The router responds its name.

Format	Example
Command {i}	→ {i}
Response (<PRODUCT_TYPE>)CrLf	← (MX8X8DVI-DL)CrLf

Legend:

<PRODUCT_TYPE>	inputs	outputs	interface
MX6X6DVI-SL	6	6	single link
MX8X8DVI-SL	8	8	single link
MX6X6DVI-DL	6	6	dual link
MX8X8DVI-DL	8	8	dual link

Important! *If CPU FW version 1.4.8 is installed in the matrix, the product type is "MX8X8DVI_S" and "MX8X8DVI_D". See appendix in section 12.1 on page 76 for more information.*

8.4.2. View serial number

Description: The router responds its 8-digit serial number.

Format	Example
Command {s}	→ {s}
Response (<SERIAL_NUMBER>)CrLf	← (SN:09410135)CrLf

Info: *Only the last 4 numbers are written onto the back of the router*

8.4.3. View Firmware version of the CPU

Description: View the CPU firmware revision. To view another controller's firmware revision see → '*Query* cards' firmware' {FC}.

Format	Example
Command {f}	→ {f}
Response (<FW_VERSION>)CrLf	← (FW:2.5.0)CrLf

8.4.4. View Installed i/o cards' hardware

Description: Shows the hardware name and revision of the installed cards.

Info: This router model is a compact type, so there are no separate input / output cards.

Format	Example 1
Command {is}	→ {is}
Response (<SL# 0 MB_DESCRIPTOR>)CrLf	← (SL# 0 MX-6x6-DVI SCH_1.1 PCB_1.1)CrLf

Explanation 1 (MX6x6DVI router): The router has only one card, with 6 inputs and 6 outputs. All cards are single link DVI-D.

Format	Example 2
Command {is}	→ {is}
Response (<SL# 0 MB_DESCRIPTOR>)CrLf	← (SL# 0 MX-8x8-DVI-DL SCH_1.1 PCB_1.1)CrLf

Explanation 2 (MX8x8DVI-DL router): The router has only one card, with 8 inputs and 8 outputs. The router is dual link capable.

Important! If CPU FW version 1.4.8 is installed in the matrix, the response will contain an extra space character after the PCB version: (SL# 0 MX-8x8-DVI-DL SCH_1.1 PCB_1.1●). See appendix in section 12.1 on page 76 for more information.

8.4.5. View installed controllers' firmware

Description: Shows the firmware revisions of the installed controllers.

Format	Example
Command {fc}	→ {fc}
Response (<CARD_FIRMWARE>)CrLf	← (CF MX-CP FW:1.0.4 @ 0x10)CrLf (CF MX8x8EDID v1.9.1 @ 0x50)CrLf ←

8.4.6. View current control protocol

Description: Shows the RS-232, TCP/IP control protocol.

Format	Example
Command {p_?}	→ {p_?}
Response CURRENT●PROTOCOL●=●#<x>)CrLf	← (CURRENT PROTOCOL = #1)CrLf

Legend: <x> stands for the active protocol.

Explanation: Protocol 1 is active here.

8.4.7. Set current control protocol

Description: Sets the current RS-232, TCP/IP control protocol (Default is '1').

Format	Example
Command {p_x}	→ {p_1}
Response (PROTOCOL●#<x>● SELECTED!)CrLf	← (PROTOCOL #1 SELECTED!)CrLf

Legend: <x> stands for the selected protocol.

Explanation: Protocol 1 is activated.

8.5. EDID router commands

8.5.1. Route EDID to the selected input (static)

Description: Copies EDID from location <loc> to input <in>. <loc> must be 1..100.

Format	Example
Command {<in>:<loc>}	→ {5:10}
Response (E_SW_OK)CrLf	← (E_SW_OK)CrLf
(E_S_C) CrLf	← (E_S_C) CrLf

Explanation: EDID from memory location 10 is copied to input 5.

Note: The router send (E_S_C) only if the new EDID is different from the earlier one.

8.5.2. Route EDID to the selected input (dynamic)

Description: Copies EDID from location <loc> to input <in>. Location <loc> should be 101...108 (MX8x8DVI, MX8x8DVI-DL) or 101...106 (MX6x6DVI, MX6x6DVI-DL) as opposed to static routing where <loc> should be between 1..100.

Format	Example
Command {<in>:<loc>}	→ {4:102}
Response (E_SW_OK)CrLf	← (E_SW_OK)CrLf
(E_S_C) CrLf	← (E_S_C) CrLf

Info: Outputs 1..8 are mapped to logical addresses 101..108.

Explanation: EDID from output 2 is copied to input 4.

After choosing dynamic EDID routing to one (or all inputs) the router will follow the EDID changes occurring on the output it was connected to. Every time a different EDID is recognized on the output, it is copied instantly to the input.

8.5.3. Route one EDID to all inputs

Description: Copies EDID from the selected location <loc> to all inputs.

Format	Example
Command {A:<loc>}	→ {A:48}
Response (E_SW_OK)CrLf	← (E_SW_OK)CrLf
(E_S_C) CrLf	← (E_S_C) CrLf

Explanation: EDID from memory location 48 is copied to all inputs.

8.5.4. View EDID switch status on all inputs

Description: Indexes show the actual input and the number at the given index (<in1>..<inN>) shows which EDID is switched to that particular input where N represents the maximal input number of the given configuration.

Format		Example 1 (MX8x8)
Command	{VEDID}	→ {VEDID}
Response	(VEDID●<IN1>●<IN2>●<IN3>●<IN4>●<IN5>●<IN6>●<IN7> ●<IN8>)CrLf	← (VEDID 048 048 053 101 101 101 101 101)CrLf

Legend: Any <INx> indexes are **three digit** numbers showing the current EDID that is routed to the corresponding input. Respond length depends on input number of the router.

Explanation: Factory preset EDID from memory location 48 is emulated on inputs 1 and 2. User saved EDID from memory location 53 is emulated on input 3. EDID from output 1 is dynamically emulated on inputs 5, 6, 7, and 8.

Important! *Above mentioned command is not supported by CPU FW version 1.4.8. See appendix in section 12.1 on page 76 for more information.*

8.5.5. Save EDID from output to memory location (Learn EDID)

Description: Learn EDID from the specified output <out> to the specified location <loc>. Memory locations 51..100 are available for saving learned EDIDs.

Format		Example
Command	{<out>><loc>}	→ {4>51}
Response	(E_SW_OK)CrLf	← (E_SW_OK)CrLf
	(E_S_C) CrLf	← (E_S_C) CrLf

Explanation: EDID from output 4 is saved to EDID memory location 51.

Important! *If CPU FW version 1.4.8 is installed in the matrix, the response will be (E_SA_OK). See appendix in section 12.1 on page 76 for more information.*

8.5.6. View EDID validity table

Description: Shows EDID validity table, which contains information about the EDID states.

Format		Example
Command	{wv}	→ {wv}
Response	(EV●<VALIDITY_TABLE>)CrLf	← (EV **11111111111111111111111111111111111111111111111111**00000000000000000000000000000000000000000000000010***11110000111131111***) CrLf

Legend: Response length is 116 characters. Each number represents the EDID validity state for the corresponding memory location. The first 50 numbers (bold) are representing the factory preset EDIDs, the second 50 numbers are representing the User saved EDIDs. Next 8 numbers (italic) are showing the outputs' EDID state, and the last 8 numbers (bold and italic) are showing the emulated EDIDs on the inputs.

Value	Description
'0'	invalid EDID
'1'	valid EDID
'3'	changed EDID

If a changed EDID is queried by the {wh} command (see next section), its value returns to '1'.

Explanation: There is one '3' in the table on the 113th position. This means that the emulated EDID on input 5 is changed since the last EDID query on that port.

8.5.7. View EDID header

Description: EDID_HEADER consist of 3 fields:

PNPID code The three letter abbreviation of the manufacturer

Preferred resolution The resolution and refresh rate stored in the preferred detailed timing block.

Name The name of display device stored in product descriptor.

Format	Example
Command {wh<loc>} Response (EH#<loc>● <EDID_HEADER>)CrLf	→ {wh104} ← (EH#104 NEC 1280x1024@60 LCD1970NXp)

Explanation: Shows the EDID from memory location 104.

8.5.8. Download EDID content from the router

Description: EDID hex bytes can be read directly. The router will issue the whole content of the EDID present on memory location <loc> (256 bytes).

Format	Example
Command {we<loc>} Response (EB#<loc>●<B1> ●<B2>●..●<B256>)CrLf	→ {we1} ← (*EB#1 00 FF FF FF FF FF FF 00 32 F2 00 00 00 .. .. .. 00 92*) CrLf

Legend: <B1>..<B256> are space separated hex characters displayed in ASCII format.

Explanation: Full EDID from memory location 1 is downloaded.

8.5.9. Upload EDID content to the router

Description: EDID hex bytes can be written directly to the user programmable memory locations (locations #51...#100).

Sequence:

Step 1. Prepare the router to accept EDID bytes to the specified location <loc> with command *{WL#<loc>}*

Step 2. Router responds that it is ready to accept EDID bytes with *(E_L_S)CrLf*

Step 3. Send 1 block of EDID (1 block consist of 8 bytes of hex data represented in ASCII format) with command *{WB#<num>●<B1>●<B2>●<B3>●<B4>●<B5>●<B6>●<B7>●<B8>}*

Step 4. The router acknowledges with response *(EL#<num>)*

Step 5. Repeat steps 3 and 4 to send the remaining 31 blocks of EDID (32 altogether)

Step 6. After the last acknowledge, the router indicates that the EDID status changed by sending *(E_S_C) CrLf*

Format		Example
Command	{WL#<loc>}	{WL#53}
Response	(E_L_S)CrLf	(E_L_S) CrLf
Command	{WB#1●<B1>●<B2>●<B3>●<B4>●<B5>●<B6>●<B7>●<B8>}	{WB#1 00 FF FF FF FF FF FF 00}
Response	(EL#●)CrLf	(EL#1) CrLf
Command	{WB#2●<B9>●<B10>●<B11>●<B12>●<B13>●<B14>●<B15>●<B16>}	{WB#2 38 A3 8E 66 01 01 01 01}
Response	(EL#●) CrLf	(EL#2) CrLf
	:	:
	:	:
Command	{WB#32●<B249>●<B250>●<B251>●<B252>●<B253>●<B254>●<B255>●<B256>}	{WB#32 36 59 42 0A 20 20 00 96}
Response	(EL#●) CrLf	(EL#32) CrLf
Response	(E_S_C) CrLf	(E_S_C) CrLf

Legend: <num> represents the sequential number of every 8 byte part of EDID. <num> is between 1 and 32. <B1>..<B256> are the bytes of EDID.

Explanation: Full EDID uploaded to memory location 53.

8.6. Router initiated commands

8.6.1. EDID status changed

Description: This is sent after all commands which changes the EDID (EDID copy, EDID switch), or after a new EDID source ie. a new display device is connected to the router.

Format		Example
Command	various	→ {5:101}
Response	(E_S_C) CrLf	← (E_SW_OK)CrLf (E_S_C) CrLf ←

Explanation: Copy EDID from output 1 to input 5 (dynamic emulation). First response confirms the EDID routing command. (E_S_C) response is an automatic message that is sent because an EDID has changed.

Info: The router stores the last attached display device's EDID connected to the output. After disconnecting this device its EDID is still present at the router's memory, therefore no status change message is issued by the router if a display device having the same EDID is connected to that output. (The same display device is connected again, or another display device (same brand) from the same manufacturer)

Info: To keep your application in sync with the router it is recommended to issue a show validity ({wv}) command after receiving an EDID status changed response, and read all location indicating '3' in the table, as the change of these EDID triggered the EDID status changed response.

8.6.2. Error responses

Important! There are minor differences between the error responses according to the installed CPU FW version as indicated below. See appendix in section 12.1 on page 76 for more information.

Invalid input number

Description: Given input number exceeds the maximum number of inputs or equals zero.

Response if CPU FW version 1.4.8 is installed	(ERR1)CrLf
Response if CPU FW version 2.5.0 or above is installed	(ERR01)CrLf

Invalid output number

Description: Given output number exceeds the installed number of outputs or equals zero.

Response if CPU FW version 1.4.8 is installed	(ERR2)CrLf
Response if CPU FW version 2.5.0 or above is installed	(ERR02)CrLf

Invalid value

Description: Given value exceeds the maximum allowed value can be sent.

Response if CPU FW version 1.4.8 is installed	(ERR3)CrLf
Response if CPU FW version 2.5.0 or above is installed	(ERR03)CrLf

Invalid preset number

Description: Given preset number exceeds the maximum allowed preset number.

Response if CPU FW version 1.4.8 is installed	(ERR4)CrLf
Response if CPU FW version 2.5.0 or above is installed	(ERR04)CrLf

Info: The maximum preset number is limited to 32 for all routers.

8.7. Commands – Quick summary

Control commands

Command description	See in chapter	Command
Switch one input to one output	8.3.1	{<in>@<out>}
Switch one input to all outputs	8.3.2	{<in>@O}
View connection on the specified output	8.3.3	{?<out>}
View connection on all outputs	8.3.4	{VC}
View mutes on all outputs	8.3.5	{VM}
Mute specified output	8.3.6	{#<out>}
Unmute specified output	8.3.7	{+<out>}
Lock specified output	8.3.8	{#><out>}
Unlock specified output	8.3.9	{+<<out>}
Save preset to the specified memory location	8.3.10	{$<id>}
Load preset from the specified location	8.3.11	{%<id>}
Preview preset	8.3.12	{VP#<id>=?}
Renaming presets	8.3.13	{PNAME#<id>= <name>}
Renaming inputs	8.3.13	{INAME#<id>= < name>}
Renaming outputs	8.3.13	{ONAME#<id>= < name>}
Query names of Presets / Inputs / Outputs	8.3.14	{PNAME#<id>= ?}
Set default names of Presets / Inputs / Outputs	8.3.15	{PNAME#<id>= !}
Reload factory default output setup	8.3.16	{r00}
Query IP settings	8.3.17	{IP_CONFIG=?}
Reload factory default IP settings	8.3.18	{IP_CONFIG=!}
Load DHCP IP settings (only IP address!)	8.3.19	{IP_CONFIG=D}

Router status commands

Command description	See in chapter	Command
View product type	8.4.1	{i}
View serial number	8.4.2	{s}
View Firmware version of the CPU	8.4.3	{f}
View Installed i/o cards' hardware	8.4.4	{is}
View installed controllers' firmware	8.4.5	{fc}
View current control protocol	8.4.6	{p_?}
Set current control protocol	8.4.7	{p_x}

EDID router commands

Command description	See in chapter	Command
Route EDID to the selected input (static)	*8.5.1*	{<in>:<loc>}
Route EDID to the selected input (dynamic)	*8.5.2*	{<in>:<loc>}
Route one EDID to all inputs	*8.5.3*	{A:<loc>}
View EDID switch status on all inputs	*8.5.4*	{VEDID}
Save EDID from output to memory location (Learn EDID)	*8.5.5*	{<out>><loc>}
View EDID validity table	*8.5.6*	{wv}
View EDID header	*8.5.7*	{wh<loc>}
Download EDID content from the router	*8.5.8*	{we<loc>}
Upload EDID content to the router	*8.5.9*	{WL#<loc>}

9. Firmware upgrade

Using Lightware bootloader application to upgrade router's firmware

Info: The matrix router can only be upgraded via LAN, so connect the matrix router to the local subnet. Be sure that there is no other active connection with the router via Ethernet.

Install the bootloader application with "Installer_LW_bootloader.exe"

Step 1. Download and save all the firmware files that you want to load. If you have a zipped archive, extract it.

Step 2. Run the application from

Start Menu → Programs → Lightware → LW_bootloader.

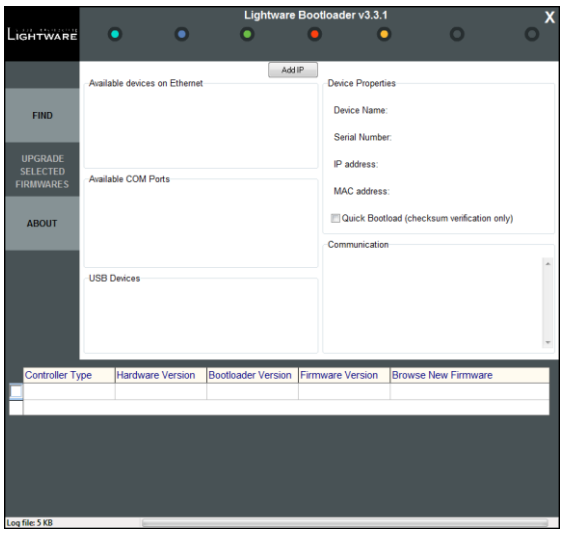
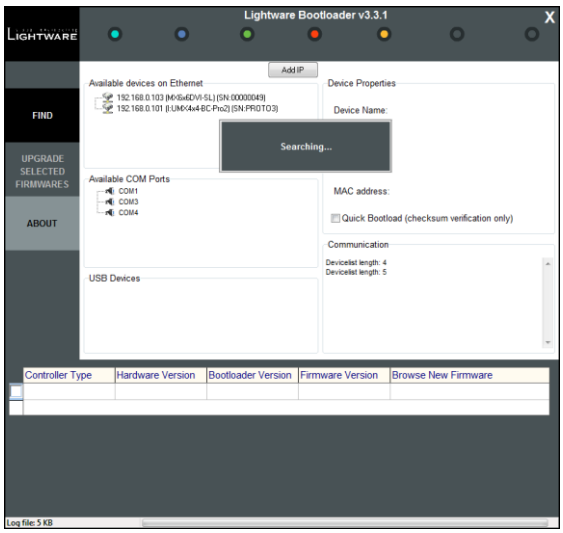


Figure 9-1. Bootloader main screen

Step 3. Click "FIND" Button!

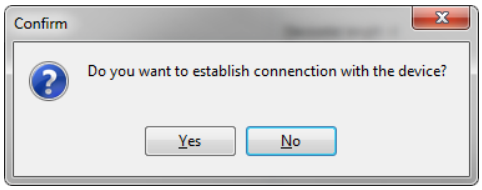
If the bootloader finds one or more routers their IP addresses will be listed in the tree view window. On the tree view, device type and serial number is shown after the IP address.

Info Note, that you must wait until all the devices on the network completely start up, before pressing FIND button.



Step 4. Select the desired device.

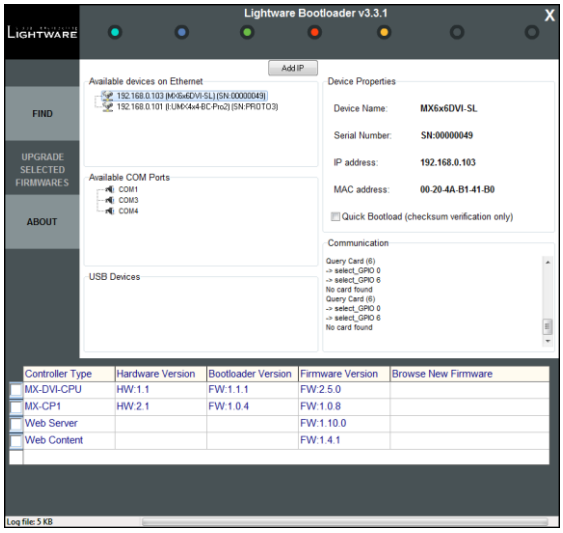
Double click on the IP address, then click "YES" to establish connection with the matrix router. It will take 10-15 secs to get all information from the router.



Warning! *The bootloader application will hold the router in reset state when it establishes the connection. All connected DVI sources and monitors will act as if the router was powered down.*

Step 5. Review the firmware versions

After the connection is made, the device properties, and the installed hardware parts are displayed.



Select the controller(s) that need(s) new firmware by clicking the checkbox next to it.

MX-DVI-CPU is the main processor's firmware. MX-CP1 is the firmware for the front panel. EDID router has a separate controller as well, but it is not firmware upgradeable in this product.

Step 6. Browse for the new firmware(s)

Click the corresponding cell in the "Browse New Firmware" column. A dialog pops up, to confirm if you really want to modify the path. Now you can browse for the new firmware file to upload. After opening the new file, the new firmware field will contain the name of the firmware file.

Controller Type	Hardware Version	Bootloader Version	Firmware Version	Browse New Firmware
☑ MX-DVI-CPU	HW:1.1	FW:1.1.1	FW:2.5.0	MX-CPU1_CPU_v2.5.0.hex
☐ MX-CP1	HW:2.1	FW:1.0.4	FW:1.0.8	
☐ Web Server			FW:1.10.0	
☐ Web Content			FW:1.4.1	

Step 7. Upgrade firmware(s)

Click "UPGRADE SELECTED FIRMWARES" button. A confirmation message appears. After clicking the "YES" button the selected controllers are being reprogrammed, with the firmware you selected. If you select a file that doesn't fit for the selected controller, you will get an information message about which file is wrong. If you selected a controller to upgrade, but you had not selected a file for it, then you will also get an information message about which file is missing.

Quick Bootload mode can be switched on or off any time. It makes the bootloader software faster by only checking the checksum of the controller. No data verification is done after writing if the checksum was correct.

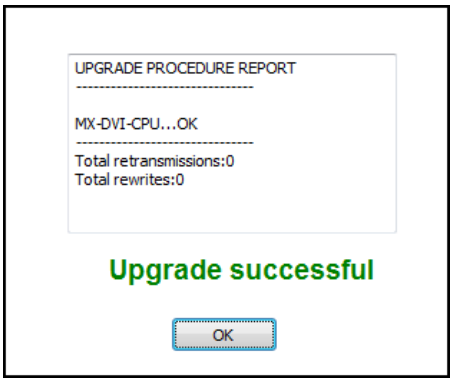
Info: *The reprogramming can take between 3-8 minutes per controller.*

A progress bar will show the current state of the reprogramming. An erasing process will take place first, and then the programming is done, so the progress bar runs up twice.

When the reprogramming is finished, a “Done!” message will appear in the bottom left corner. The application closes the connection, and the router restarts.

Step 8. Done!

If the upgrade was successful, the following window pops up:



Now you can close the application, or you can select another matrix router to upgrade. After closing the bootloader application, switch the upgraded devices off and then on. Now the router is ready to be used with the new firmware!

10. Troubleshooting

10.1. General problems

Check the router

Check whether the router is properly powered and whether CPU LIVE LED is blinking. Try performing a reset through the controller software, or unplug and reconnect the router's power cable.

10.2. Serial connection problems

Check the protocol

Check whether the proper protocol is selected (see section 8.1 on page 51 for more information). Select Protocol #1 in order to use the matrix with the controller software.

Check the cable and software settings

Check whether your null-modem cable is properly connected. In most cases there are more COM ports present in the operating system. Please verify the connection settings of your software. The router communicates with **9600** Baud, **8** data bit, **N**o parity, **1** stop bit.

10.3. TCP/IP connection problems

Check the LAN cable type

If you connect the router directly to your computer, you must use a cross-link cable. If the matrix is connected to an Ethernet hub, switch or router, you have to use a straight patch LAN cable.

Check the network connection

The computer and the router have to be in the same network. If your computer has multiple network connections (for example Wi-Fi and LAN connections are used simultaneously), check which network the router is connected to. The appropriate Ethernet interface has to be selected in the Find dialog box of the Lightware Device Controller software (see section 6.3 on page 29 for more information.).

Check the IP settings

If you connect the router directly to your computer, you have to set the router's IP address manually, since in this case there is no DHCP server that could assign an address to the matrix.

If the IP address is set manually, check if there is an IP address conflict. If there is a DHCP server on the network, try to set the matrix to DHCP mode. See section 4.3.2 on page 24 about how to reset the IP address with the front panel buttons.

Check whether your computer's firewall blocks the selected port.

Check the protocol

Check whether the proper protocol is selected (see section 8.1 on page 51 for more information). Select Protocol #1 in order to use the matrix with the controller software.

Check alive connections

Only one connection is allowed simultaneously. Check whether there is another open connection (e.g. opened router web interface, running control software over Ethernet). Try restarting the router if you have no other option.

10.4. Picture is not displayed or distorted

Check the cables

Due to the high data rates, the cables must fit very well. DVI connectors have to be locked with screws, no tensions or breaches are allowed. If your source or display has more connectors then make sure that the proper interface is selected.

Since this matrix switcher provides no input equalization, only standard length (max. 5 meter) DVI cables can be used. Always use high quality DVI cable for connecting sources and displays.

Although the router is equipped with DVI-I connectors, analog signals are not supported. You cannot use VGA cables with DVI-VGA adapter plugs.

If you want to route dual link signals, check if the cables are capable of this. See section *3.4* on page *16* for more information.

Check the crosspoint matrix

Check the connection between the input and output port either on the front panel or from web or the control software. Check whether the output is muted or not.

Check EDID related problems

Maybe your display device is not capable of receiving the sent video format. Try emulating your display device's EDID to the source. You will find help about this process in section 6.9 on page 39, or in section *7.3.1* on page *47.* If you get a picture now, you have an EDID related issue, please read section *3.1* on page *15* for more details.

Check the source

Check whether your source is powered on and configured properly. The HDMI output can be turned off on most DVD players. If the source is a computer, then verify that the DVI output is selected and active. Try restarting your computer; if you get a picture during the booting process, you have to review the driver settings.

The router is not HDCP compliant; therefore encrypted sources will not work.

11. Specifications

General

Power ..... 100-240 V AC 50/60 Hz 3 A

Compliance ..... CE, UL, FCC

EMI/EMC ..... EN 55103-1, EN 55103-2

Safety ..... EN 60065 Class I

Warranty ..... 3 years

Enclosure

Rack mountable ..... Yes, 3U high

Material ..... 1 mm Metal

Dimensions .....482 mm W x 102 mm D x 133 mm H

Net Weight ..... 4.15 kg

Inputs

Connectors ..... 29-pole DVI-I digital only

Input cable equalization ..... No

EDID emulation ..... Yes, for each input connector

Signal

Data rate: ..... all between 25 Mbps and1.65 Gbps / TMDS channel

Channels: ..... 1x TMDS Clock + 3x TMDS Colors (6x TMDS for Dual link)

Resolutions: .....all from 640x480
.....up to 1920x1200@60Hz or 2048x1080@60Hz (single link)
.....up to 3840x2400@30Hz or 4096x2400@24Hz (dual link)

Color depth: ..... 24 bits, 8 bit/color

Color format ..... RGB only

HDTV resolutions: 720p, 1080i, 1080p

HDCP compliant: ..... No

Outputs

Connectors..... 29 pole DVI-I digital only

Output pre-emphasis ..... No

Reclocking ..... No

+5V output current .....500 mA continuous each, with overcurrent protection

Control

Front Panel buttons..... Yes, 21 buttons

Serial Port ..... 9 pole D-SUB female RS-232 or RS-422

Baud rate ..... 9600 Baud, 8 bit, 1stop bit, no parity

Ethernet port ..... RJ45 female connector

Ethernet protocol..... TCP/IP, HTTP, TFTP, Telnet

IP address assignment .....fixed, DHCP, BOOTP, and AutoIP

11.1. DVI Timing examples

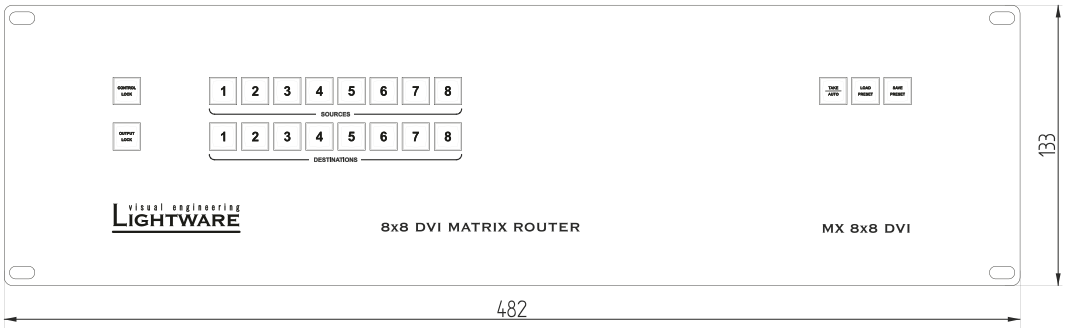
Resolution	Vertical frequency (Hz)	Horizontal frequency (KHz)	Pixel Clock frequency (MHz)	Comment
640x480	60.00	31.47	25.18	**DOS VGA**
800x600	60.32	37.88	40	**VESA SVGA**
800x600	75.00	46.87	49.5	**VESA SVGA**
832x624	74.55	49.72	57.29	**MACINTOSH**
1280x720	60.00	45.00	74,25	**HDTV 720p**
1024x768	60.00	48.36	65	**VESA XGA**
1024x768	75.00	60.02	78.75	**VESA XGA**
1360x768	47.7	60.00		**WIDE-XGA**
1152x870	75.06	68.68	100	**MACINTOSH**
1280x1024	75.00	80.00	135.00	**VESA SXGA**
1400x1050	60.00	65.64	121.82	**SXGA+**
1920x1080	60.00	67.50	148.5	**HDTV 1080p**
2048x1080	60.00	67.50	157.3	**2K**
1600x1200	60.00	75.00	162	**VESA UXGA**
1920x1200	60.00	75.00	162	**VESA**

Table 11-1. DVI Timing examples for some typical supported resolutions

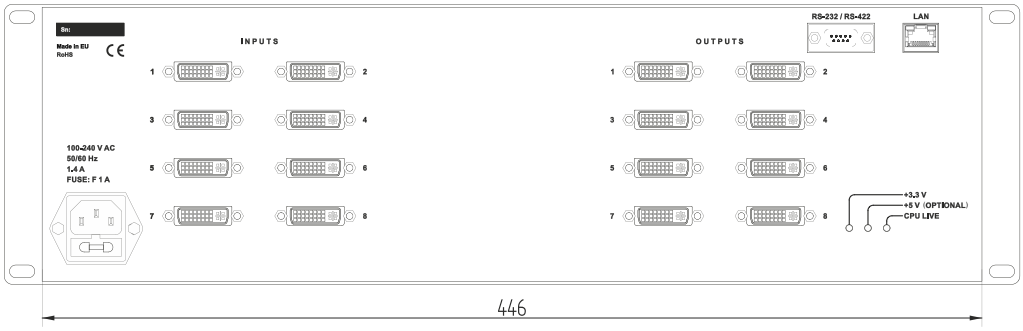
11.2. Mechanical drawings

Dimensions are in mm.

Front view

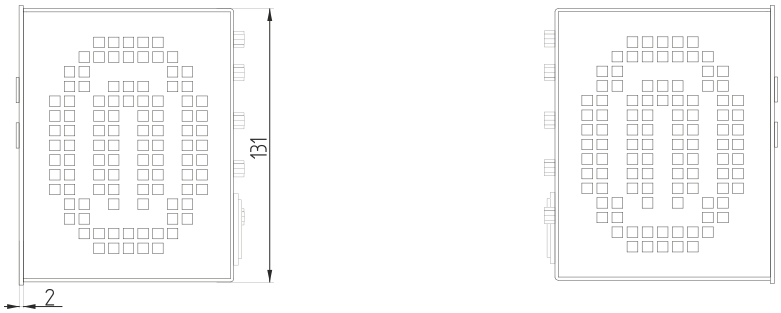


Rear view



Top view

Side view

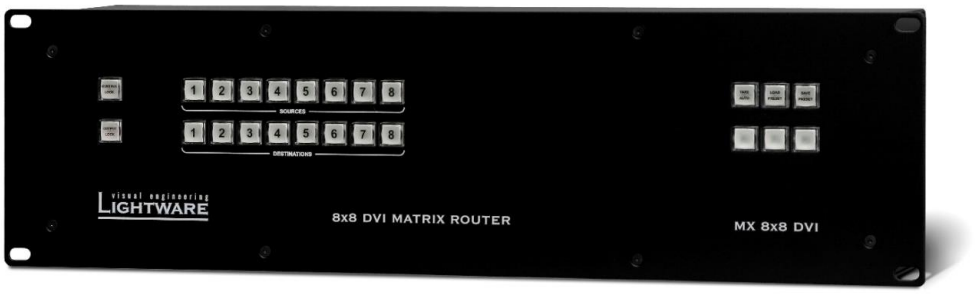


12. Appendix

12.1. CM-1002 Notes

MX6x6DVI, MX8x8DVI, MX-6x6DVI-DL, MX8x8DVI-DL

Notes on upgrade CPU versions from 1.4.8 to 2.5.0 and above



From January 2014 Lightware ships these matrix routers with an improved CPU firmware. This change includes some new features and also may affect the remote control operations. Please consider these protocol changes if you control the matrix with an external controller.

These differences are highlighted here and in the User Manual revision v1.1 as well.

Last version of earlier generation CPU firmware: v 1.4.8

First version of current generation CPU firmware: v 2.5.0

Differencies in operation

Output mute

Function	CPU 1.4.8	CPU 2.5.0 and above	Notes
Switch unmutes muted output	Yes	No	-
Switch let muted output in mute state until unmute command issued	No	Yes	-

Firmware upgrade

Function	CPU 1.4.8	CPU 2.5.0 and above	Notes
Upgrade possible with Bootloader v1.3.0	Yes	No	-
Upgrade possible with Bootloader v3.x.x	Yes	Yes	-

Differencies in Command responses

Command	CPU 1.4.8 Response	CPU 2.5.0 and above Response	Notes
{r00}	(DVP FF FF FF FF FF FF 05)	(APWSE)CrLf	Reload factory default output setup
-	(ERR1)CrLf	(ERR01)CrLf	Invalid Input number
-	(ERR2)CrLf	(ERR02)CrLf	Invalid Output number
-	(ERR3)CrLf	(ERR03)CrLf	Invalid value
-	(ERR4)CrLf	(ERR04)CrLf	Invalid Preset number
{vc}	(ALL●<O1>●<O2>●<O3>●<O4>●<O5>●<O6>●<O7>●<O8>●)CrLf	(ALL●<O1>●<O2>●<O3>●<O4>●<O5>●<O6>●<O7>●<O8>)CrLf	View connection on all outputs (no extra space character after output 8)
{vm}	(MUT●<M1>●<M2>●<M3>●<M4>●<M5>●<M6>●<M7>●<M8>)CrLf	(MUT●<M1>●<M2>●<M3>●<M4>●<M5>●<M6>●<M7>●<M8>)CrLf	v1.0 Manual was wrong: (MUT●<M1>●<M2>●<M3>●<M4>●<M5>●<M6>●<M7>●<M8>●)CrLf
{i}	(MX8X8DVI_D)CrLf or (MX8X8DVI_S)CrLf	(MX8X8DVI-DL)CrLf or (MX8X8DVI-SL)CrLf	View product type
{is}	(SL# 0 MX-8x8-DVI-DL SCH_1.1 PCB_1.1●)	(SL# 0 MX-8x8-DVI-DL SCH_1.1 PCB_1.1)	View Installed i/o cards' hardware
{4>51}	(E_SA_OK)CrLf	(E_SW_OK)CrLf	Save EDID from output to memory location (Learn EDID)

Commands that CPU 1.4.8 doesn't recognize

Command	CPU 1.4.8 support	CPU 2.5.0 and above support	Notes
{IP_CONFIG=?}	No	Yes	Query IP settings
{IP_CONFIG=!}	No	Yes	Reload factory default IP settings
{IP_CONFIG=D}	No	Yes	Load DHCP IP settings (only IP address!)
{VP#<id>=?}	No	Yes	Preview preset
{PNAME#<id>= <name>}	No	Yes	Renaming Presets
{INAME#<id>= < name>}	No	Yes	Renaming Inputs
{ONAME#<id>= < name>}	No	Yes	Renaming Outputs
{PNAME#<id>= ?}	No	Yes	Query names of Presets
{INAME#<id>= ?}	No	Yes	Query names of Inputs
{ONAME#<id>= ?}	No	Yes	Query names Outputs
{PNAME#<id>= !}	No	Yes	Set default names of Presets
{INAME#<id>= !}	No	Yes	Set default names of Inputs
{ONAME#<id>= !}	No	Yes	Set default names of Outputs
{VEDID}	No	Yes	View EDID switch status on all inputs

13. Version applicability

This User's Manual applies to the following versions of the mentioned software:

Component	Version
Lightware Device Controller software	1.4.0b2
Lightware Bootloader software	3.3.1
Router CPU firmware (MX-DVI-CPU)	2.5.0
Router EDID firmware	1.9.5
Router Control Panel firmware (MX-CP1)	1.0.8
Router Web Server	1.1.5
Router Web Content	1.4.1
Router Motherboard	PCB 1.1

14. Warranty

Lightware Visual Engineering warrants this product against defects in materials and workmanship for a period of three years from the date of purchase.

The customer shall pay shipping charges when unit is returned for repair. Lightware will cover shipping charges for return shipments to customers.

In case of defect please contact your local representative, or Lightware at

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15. Document revision history

Document	Release Date	Changes	Editor
Rev. 0.8b	19-04-2010	First beta edition	Tamas Lehel
Rev. 1.0	02-06-2010	Initial version	Tamas Lehel
Rev. 1.1	09-01-2014	Highlighting firmware version differences. Minor typographic corrections.	Laszlo Zsedenyi
Rev. 1.2	27-01-2015	Software control chapter is upgraded with LDC; Web control and Firmware upgrade chapters upgraded.	Laszlo Zsedenyi